



Chemistry

Class - XII

Chapter Assignments

Chapter 1

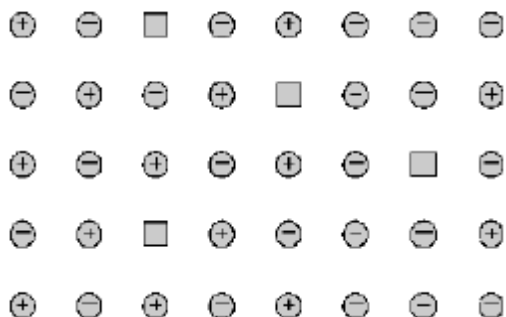
Solid State

1 mark Questions

1. What is the number of unit cells in 936 u of sodium chloride?
2. MgO has NaCl structure, what is the coordination number of both ions.
3. What type of substances would make better permanent magnets, Ferromagnetic or Ferrimagnetic.
4. In corundum, oxide ions are arranged in hcp arrangement and the aluminium ions occupy $\frac{2}{3}$ of the octahedral voids. What is the formula of corundum?
5. A compound contains two types of atoms - X and Y. It crystallizes in a cubic lattice with atom X at the corners of the unit cell and atoms Y at the body centre. What is the simplest possible formula of this compound?
6. Name the type of point defect that occurs in a crystal of zinc sulphide.
7. How many octahedral voids are there in 0.5 mole of a compound having cubic close packed structure?
8. What do you mean by paramagnetic substance?
9. Name the type of point defect that occurs in a crystal of zinc sulphide.
10. Which substance exhibit schottky and Frenkel both defects.
11. What is anisotropy?
12. What are f-centres?
13. Stability of a crystal is related to the magnitude of its melting point." How?
14. What type of interactions hold the molecules together in a polar molecule solid?
15. What are the differences between frenkel and schottky defect?
16. In terms of band theory what is the difference
 - Between conductor and an insulator
 - Between a conductor and a semi-conductor
17. Calculate the number of atoms in a face centered cubic unit cell. What type of stoichiometric defect is shown by NaCl.
18. What is doping in a semiconductor?
19. Which point defect in crystals of a solid decreases the density of the solid?
20. How many lattice points are there in one cell of -
a) fcc b) bcc c) simple cubic

2/3 MARKS QUESTIONS

- If the atoms of an element have the radius r , then in a primitive cubic unit cell, Calculate
 - The length of the face diagonal.
 - The length of the body diagonal.
- An alloy of gold and cadmium crystallizes with a cubic structure in which gold atoms occupy the corners and cadmium atoms fit into the face centres. Assign formulae for this alloy.
- A metal crystallizes into two cubic phases, face-centered cubic (FCC) and body centered cubic (BCC) whose unit cell lengths are 3.5 and 3.0 Å respectively. Calculate the ratio of the densities of FCC and BCC.
- What happens when a) CsCl crystal is heated b) Pressure is applied on NaCl crystal.
- ZnO crystal appears yellow on heating. Discuss.
- Crystals containing F-centers are generally paramagnetic. Discuss.
- Examine the illustration of a portion of the defective crystal given below and answer the following questions.



- What are these type of vacancy defects called?
 - How is the density of a crystal affected by these defects?
 - Name one ionic compound which can show this type of defect in the crystalline state
 - How is the stoichiometry of the compound affected?
- In an ionic compound the anion (N^-) form cubic close type of packing. While the cation (M^+) occupy one third of the tetrahedral voids. Deduce the empirical formula of the compound and the coordination number of (M^+) ions.
 - Iron crystallizes in bcc structure. Calculate the radius of Fe atom if edge length of unit cell is 286 pm.
 - Xe crystallizes in fcc structure and edge of the unit cell is 620 pm calculate nearest neighbor distance.
 - A metal (atomic mass = 50) has a bcc structure. The density of metal is 5.96 g/cm³. Find the volume of the cell.
 - In Chromium (III) Chloride, $CrCl_3$, chloride ions have cubic close packed arrangement and Cr (III) ions are present in the octahedral holes. What is the fraction of octahedral holes occupied? What is the fraction of total number of holes occupied?

13.

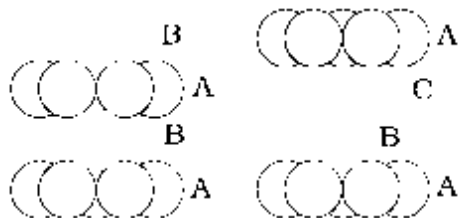


Fig. 1

Fig 2

a. What are the types of close packing shown in figure 1 and 2?

b. Write one example for each type of close packing in metals.

14. Niobium crystallizes in bcc structure. If its density is 8.55 cm^{-3} , calculate atomic radius of [At.Mass of Niobium = 92.9 u , $N_A = 6.022 \times 10^{23} \text{ atoms mol}^{-1}$].

15. The electrical conductivity of a metal decreases with rise in temperature while that of a semiconductor increases. Explain.

16. Cation vacancies in some crystals make them good catalysts. Explain ?

17. Noble Gases and metals crystallize with closed packed structure, yet the melting point of noble gas crystals is very low. Explain.

18. In a face centered cubic (fcc) crystal lattice, edge length is 4.0 pm . find the diameter of the largest sphere which can be filled into the interstitial void without distortion of the lattice.

19. A metallic element crystallizes into a lattice containing sequence of layers of ABABAB..... (Any packing of spheres leaves out voids in the lattice). What percentage by volume of this lattice has empty space?

20. With the help of suitable diagrams, on the basis of band theory, explain the difference between

i) A conductor and an insulator

ii) A conductor and a semiconductor.

21. In a face-centred cubic (fcc) crystal lattice, edge length is 400 pm . Find the diameter of the greatest sphere which can be fitted into the interstitial void without distortion of the lattice.

22. KF has NaCl structure. What is the distance between K^+ and F^- in KF if density is 2.48 gm/cc

23. Describe two main types of semiconductor and contrast their conduction mechanism.

24. The density of CsBr is 4.4 gm/cc . the unit cell edge length is 400 pm . calculate inter ionic distance in CsBr.

25. An element X with an atomic mass of 60 g/mol has density of 6.23 gm^{-3} . If the edge length of its cubic unit cell is 400 pm , identify the type of cubic unit cell. Calculate the radius of an atom of this element.

26. The metal calcium crystallizes in fcc unit cell with cell edge 0.556 nm .

Calculate the density of metal if

i) It contains 0.2% of Frenkel defects

ii) It contains 0.1% of Schottky defects.

27. Gold crystallizes in an FCC unit cell. What is the length of a side of the cell ($r=0.144 \text{ nm}$)

28. Classify the following as either p-type or n-type semiconductors.

Ge doped with In

B doped with Si

29. Aluminum crystallizes in a cubic close packed structure. Radius of the atom in the metal is 125pm.

a) What is the length of the side of the unit cell?

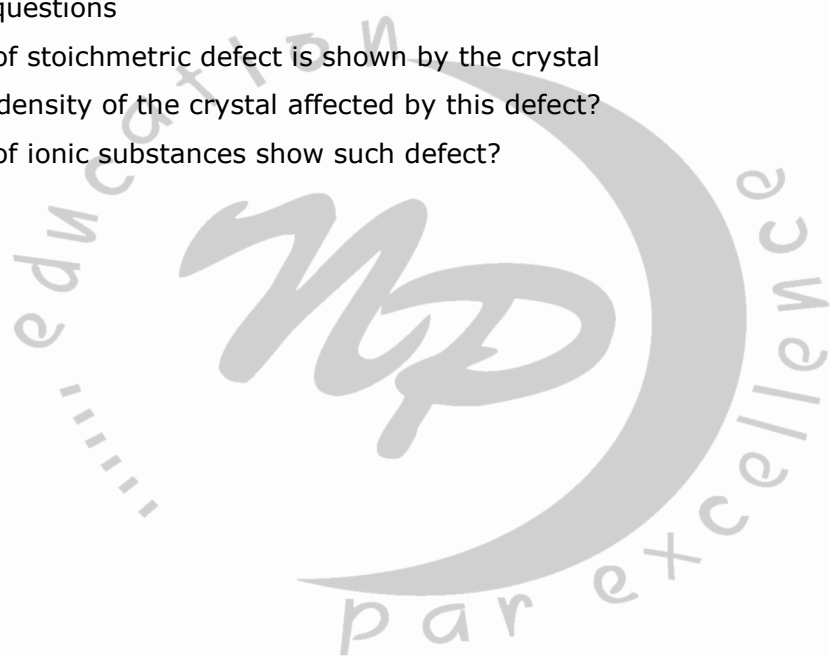
b) How many unit cells are there in 1cm^3 of aluminium.

30. Examine the given defective crystal

A^+	B^-	A^+	B^-	A^+
B^-		B^-	A^+	B^-
A^+	B^-	A^+		A^+
B^-	A^+	B^-	A^+	B^-

Answer the following questions

- What type of stoichiometric defect is shown by the crystal
- How is the density of the crystal affected by this defect?
- What type of ionic substances show such defect?



Chapter 2

Solutions

1 mark Questions

1. Why a person suffering from high blood pressure is advised to take minimum quantity of common salt?
2. What happens to vapor pressure of water, if a table spoon of glucose is added to it?
3. Equimolar solutions of glucose and sodium chloride are not isotonic. Why?
4. What are isotonic solutions?
5. Explain boiling point elevation constant for a solvent or ebullioscopic constant?
6. Two liquids A and B boil at 145°C and 190°C respectively. Which of them has a higher vapor pressure at 80°C ?
7. Semipermeable membrane of cupric ferrocyanide is not used for studying osmosis in non-aqueous solutions. Why?
8. Define mole fraction?
9. State the main advantage of molarity over molality as the unit of concentration?
10. Why is camphor preferred as a solvent in the determination of ΔT_f ?
11. Addition of HgI_2 to aq KI solution shows an increase in the vapor pressure. Why?
12. State Raoult's law?
13. Define azeotrope?
14. What is Vant Hoff factor?
15. What is reverse osmosis?

2 marks Questions

1. Arrange the following in the order of increasing i. boiling points and ii. Freezing points
a) 1M aq acetic acid b. 1M aq NaCl c. 1M aq Na_2SO_4 d. 1M aq AlCl_3
2. Calculate the number of moles of methanol in 5 L in its 2m solution, if the density of the solution is 0.981 kgL^{-1}
3. An electrolyte AB is 50 % ionized in aq solution. Calculate the freezing point of 1m aq solution.
4. State Henry's law and state its two important applications?
5. What do you mean by colligative properties, which colligative property is used to determine m.m of polymer and why?
6. Osmotic pressure of 0.0103 molar solution of an electrolyte is found to be 0.70 atm at 27°C . Calculate Vant Hoff factor. ($R=0.082\text{ Latom mol}^{-1}\text{k}^{-1}$)
7. The temperature at a hill station is -10°C . Will it be suitable to add ethylene glycol to water in the radiator sol that the solution is 30 % by mass. Why?

8. A 45 % solution of sucrose is isotonic with 3 % solution of an unknown substance. Calculate the molecular mass of the unknown substance.
9. Calculate the amount of ice that will separate out on cooling a solution containing 50 g of ethylene glycol in 200 g of water to -9.3°C .
10. The solubility of pure nitrogen gas at 25°C and 1atm is $6.8 \times 10^{-4} \text{ mol}^{-1}$. What is the concentration of nitrogen dissolved in water under atmospheric conditions? The partial pressure of nitrogen gas in the atmosphere is 0.78 atm.
11. An aqueous solution of 2% non-volatile exerts a pressure of 1.004 Bar at the normal boiling point of the solvent. What is the molar mass of the solute?
12. Explain why a solution of chloroform and acetone shows negative deviation from the Raoult's law?
13. Non-ideal solutions exhibit either positive or negative deviations from the Raoult's law. What are these deviations and why are they caused? Explain with one example of each type.
14. The depression in freezing point of water observed for the same molar concentrations of acetic acid, trichloroacetic acid and trifluoroacetic acid increases in the order as stated above. Explain?
15. Find the freezing point of a solution containing 0.520g glucose ($\text{C}_6\text{H}_{12}\text{O}_6$) dissolved in 80.2 g of water (Given. K_f for water = 1.86 K m^{-1})

3 marks Questions

1. Henry's law constant for CO_2 dissolving in water is $1.67 \times 10^8 \text{ pa}$ at 298K. Calculate the quantity of CO_2 in 1L of soda water when packed under 2.5 atm CO_2 pressure at 298K.
2. What concentration of nitrogen should be present in a glass of water at room temperature? Assume a temperature of 25°C , a total pressure 1 atmosphere and mole fraction of nitrogen in air of 0.78. (K_H for nitrogen = $8.42 \times 10^{-7} \text{ M/mm Hg}$)
3. Give reason for the following :-
 - (a) Aquatic species are more comfortable in cold waters than in warm waters.
 - (b) To avoid bends scuba divers use air diluted with helium.
 - (c) Cold drinks bottles are sealed under high pressure of CO_2
4. Why should a solution of a non-volatile and non-electrolyte solute boil at a higher temperature? Explain with the help of a diagram. Derive the relationship between molar mass and elevation in boiling point
5. Why do colligative properties of solution of a given concentration are found to give abnormal molecular weight of solute. Explain with the help of suitable examples
6. Account for the following :-
 - (a) CaCl_2 is used to clear snow from roads in hill stations.
 - (b) Ethylene glycol is used as antifreeze solution in radiators of vehicles in cold countries.
 - (c) The freezing point depression of 0.01 m NaCl is nearly twice that of 0.01 m glucose solution
7. Give reasons for the following :-
 - (a) RBC swells up and finally burst when placed in 0.1% NaCl solution.

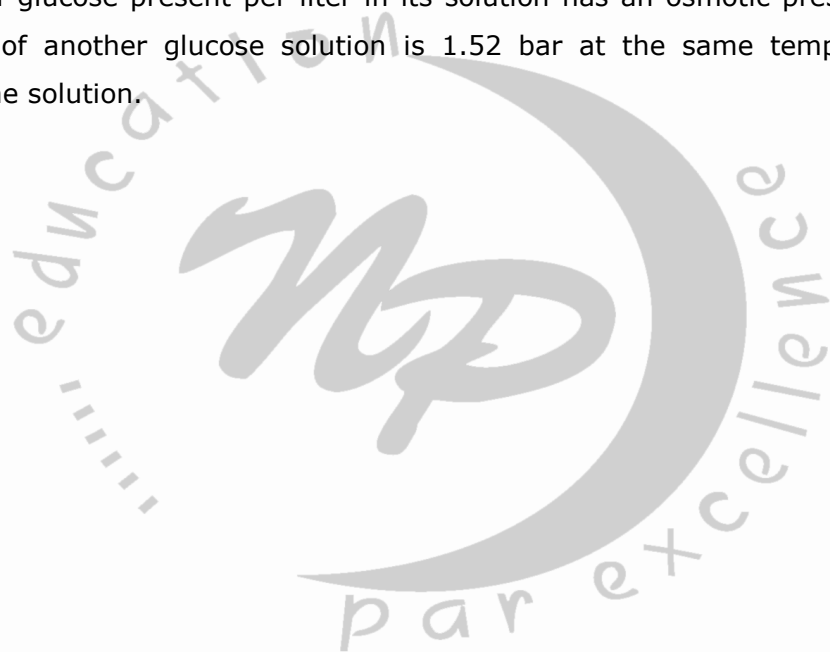
(b) When fruits and vegetables that have been dried are placed in water, they slowly swell and return to original form

8. 15.0 g of an unknown molecular substance was dissolved in 450 g of water. The resulting solution was found to freeze at -0.34°C . What is the molar mass of this substance? (K_f for water = $1.86 \text{ K kg mol}^{-1}$).
9. 75.2 g of phenol is dissolved in solvent of $K_f = 14$. If the depression in freezing point is 7K , find the % of phenol that dimerises?
10. A solution of 3.8 g Sulphur in CS_2 (boiling point 46.3°C) boils at 46.66°C . What is the formula of Sulphur molecule in this solution. K_b for $\text{CS}_2 = 2.40 \text{ kg mol}^{-1}$
11. An aqueous solution of 1.248 g of Barium chloride (molar mass = $208.34 \text{ g mol}^{-1}$) in 100 g of water is found to boil at 100.0832°C . Calculate the degree of dissociation of BaCl_2 . K_b of water = $0.52 \text{ K kg mol}^{-1}$
12. The storage battery contains a solution of sulphuric acid 38 % by mass. At this concentration van't Hoff factor is 2.50. At what temperature will the battery condense freeze? K_f for water = $1.86 \text{ K kg mol}^{-1}$
13. Calculate the amount of KCl which must be added to 1 kg of water so that the freezing point is decreased by 2K .
14. Calculate the freezing point of an aqueous solution containing 10.50g of MgBr_2 in 200g of water. (K_f for water = $1.86 \text{ K kg mol}^{-1}$, molar mass of $\text{MgBr}_2 = 185\text{g}$)
15. A 5% solution of cane sugar in water has a freezing point of 271K . Calculate the freezing point of 5% (by mass) solution of glucose in water. The freezing point of pure water is 273.15K (molar mass of cane sugar = 342g mol^{-1} and molar mass of glucose = 180g mol^{-1})
16. The boiling point elevation of 0.30 g acetic acid in 100 g benzene is 0.0633K . Calculate the molar mass of acetic acid from this data. What conclusion can you draw about the molecular state of the solute in the solution? (K_B for benzene = $2.53 \text{ K kg mol}^{-1}$)

5 marks Questions

1. i) What are ideal solutions? Write two examples.
ii) Calculate the osmotic pressure in pascals exerted by a solution prepared by dissolving 1.0g of polymer of molar mass 185000 in 450 mL of water at 37°C
2. i) Describe a method of determining molar mass of a non-volatile solute from vapour pressure lowering
ii) How much urea (mol. mass 60 g mol^{-1}) must be dissolved in 50g of water so that the vapour pressure at the room temperature is reduced by 25%? Also calculate the molality of the solution obtained
3. i) What kind of deviation is shown by a mixture of ethanol and acetone? Give reason.
ii) A solution of glucose (molar mass of glucose 180g mol^{-1}) in water is labeled as 10% (by mass). What would be the molarity and molality of the solution? (Density of solution = 1.2g mL^{-1})

4. i) Define molarity?
ii) Molal Elevation constant
iii) A solution containing 15g urea (molar mass of urea= 60g mol^{-1}) er liter of solution in water has the same osmotic pressure as a solution of glucose(180g mol^{-1})in water. Calculatethe mass of glucose present in in one liter of its solution.
5. i) What is Vant's Hoff factor? What types of values can it have if in forming the solution, the solute molecule undergoes
a) Dissociation b) association?
ii) How many mL OF A 0.1 m HCl of solution are required to react completely with 1g of a mixture of Na_2CO_3 and NaHCO_3 containing Equimolar amounts of both? ($\text{Na}_2\text{CO}_3 = 106\text{g}$, $\text{NaHCO}_3=84\text{g}$)
6. i) The molecular masses of polymers are determined by osmotic pressure method and not by measuring other colligative properties. Give two reasons?
ii) At 300k, 36g of glucose present per liter in its solution has an osmotic pressure of 4.98bar. If he osmotic pressure of another glucose solution is 1.52 bar at the same temperature, calculate the concentration of the solution.



Chapter 3

Electrochemistry

1 mark Questions

- 1F of electricity deposits 1 mole of Na from the molten salt, but 1/3 mol of Al from an aluminum salt. Why?
2. What is the role of $ZnCl_2$ in the dry cell?
3. Why blocks of Mg are often strapped to the steel hulls of ocean going ships?
4. Which of the Li^+ and Na^+ have the greater mobility in aqueous solution? Why?
5. Corrosion of motor cars is of greater problem in winter when salts are spread on roads to melt ice and snow. Why?
6. What is meant by limiting molar conductivity?
7. Express the relation between conductivity and molar conductivity of a solution held in a cell.
8. What is primary cell? Give example?
9. What is the effect of temperature on molar conductivity?
10. Name the factor on which emf of a cell depends
11. What is the EMF of the cell when the cell reaction attains equilibrium?
12. Define electrochemical series
13. How is cell constant calculated from conductance values?
14. What is the electrolyte used in a dry cell?
15. Mention the purpose of salt-bridge placed between two half-cells of a galvanic cell?
16. How is equilibrium constant of a reaction related to standard cell potential?
17. Rusting of iron becomes quicker in saline water?
18. How does specific conductance or conductivity of electrolytic solution vary with temperature?
19. Write the relation between E^\ominus_{cell} and equilibrium constant (K) of cell reaction
20. How does electrochemical series help us in predicting whether a redox reaction is feasible or not?

2 marks Questions

1. List two points of difference between metallic conductance and electrolytic conductance.
2. Which will have greater molar conductivity and why?
 - a. 1 mole KCl dissolved in 200 cc of the solution
 - b. 1 mole KCl dissolved in 500 cc of the solution.
3. List two points of difference between electrochemical cell and electrolytic cell.
4. Why is Li best reducing agent whereas Fluorine is best oxidizing agent?
5. What affects the conductivity of ionic solutions?
6. Equilibrium constant is related to E^\ominus_{cell} but not to E_{cell} . Explain.

7. Zn rod weighing 25 g was kept in 100 mL of 1M copper sulphate solution. After certain time interval, the molarity of Cu^{2+} was found to be 0.8 M. What is the molarity of SO_4^{2-} in the resulting solution and what should be the mass of Zn rod after cleaning and drying?
8. Why sodium metal is not obtained at cathode when aqNaCl is electrolyzed with Pt electrodes but obtained when molten NaCl is electrolyzed?
9. Account for the following observations:
 - (a) In a dry cell, the build up of ammonia around the carbon cathode should disrupt the electric current, but in practice this does not happen.
 - (b) Ordinary dry cells are not rechargeable
10. What are fuel cells? Describe the principle and overall reaction involved in the working of hydrogen-oxygen fuel cell or $\text{CH}_3\text{OH} - \text{O}_2$ fuel cell.
11. Explain the following observations:
 - (a) The product of electrolysis of molten NaCl is sodium metal and chlorine gas.
 - (b) The product of electrolysis of aqueous sodium chloride solution are NaOH, Cl_2 and H_2 .
12. Formulate the galvanic cell in which the following reaction takes place.

$$\text{Zn(s)} + 2\text{Ag}^+(\text{aq}) \rightarrow \text{Zn}^{2+}(\text{aq}) + 2\text{Ag(s)}$$
 - i. Which one of its electrodes is negatively charged
 - ii. The reaction taking place at each of its electrode
 - iii. The carriers of current within the cell.
13. State Kohlrausch law of independent migration of ions. Why the conductivity of a solution does decrease with dilution?
14. The conductivity of a 0.20M solution of KCl at 298K is 0.0248 S cm^{-1} . Calculate its molar conductivity.
15. Express the relation among cell constant, resistance of the solution in the cell and conductivity of the solution. How is molar conductivity of a solution related to its conductivity?
16. The standard cell electrode potential for Daniell cell is 1.1V. Calculate the standard Gibbs energy for the cell reaction. ($F = 96,500 \text{ C mol}^{-1}$)
17. What are fuel cells? Describe the principle and overall reaction involved in the working of hydrogen-oxygen fuel cell or $\text{CH}_3\text{OH} - \text{O}_2$ fuel cell
18. What is nickel-cadmium cell? State its one merit and one demerit over lead storage cell. Write the overall reaction that occurs during discharging of this cell.
19. Write the anode and cathode reactions occurring in a commonly used mercury cell. How is the overall reaction represented?
20. How many moles of mercury will be produced by the electrolyzing 10 M $\text{Hg}(\text{NO}_3)_2$ solution with a current of 2.00 A for three hours? ($\text{Hg}(\text{NO}_3)_2 = 200.6 \text{ g mol}^{-1}$)
21. Explain why electrolysis of aqueous solution of NaCl gives H_2 at cathode and Cl_2 at anode? Write overall reaction

Given, $E^0_{\text{cell}} = -2.72 \text{ V}$, $1F = 96500 \text{ C mol}^{-1}$

22. 'Corrosion is an electrochemical phenomenon', explain

3 marks Questions

1. Give reasons for :

(a) For a weak electrolyte, its molar conductivity of dilute solution increases as the concentration of solution is decreased.

(b) Molar conductivity of a strong electrolyte like KCl decreases almost linearly while increasing concentration?

(c) It is not easy to determine $\Delta^{\circ}m$ of a weak electrolyte by extrapolation of \sqrt{c} vs Δm curves

2. (a) Write the mechanism of the corrosion of metals.

(b) How underground iron pipe is protected from corrosion?

3. The standard reduction potentials are as given below :-

Half Cell	E° Value
Zn(OH) ₂ /Zn	- 1.245 V
Mg(OH) ₂ /Mg	- 2.690 V
Fe(OH) ₂ /Fe	- 0.877 V
Fe(OH) ₃ /Fe	- 2.30 V

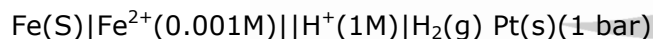
Under standard conditions:

(a) Which is the strongest reducing agent?

(b) Which reducing agent could reduce Zn(OH)₂ to Zn?

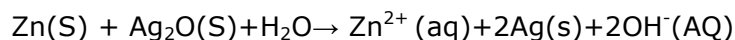
(c) Which reducing agent could reduce Fe(OH)₂ to Fe

4. Calculate the emf of the following cell at 298K



Given, $E^{\circ}_{\text{cell}} = +0.44\text{V}$

5. In the button cell, widely used in watches, the following reaction takes place



Determine E° and ΔG° for the reaction

Given, $E^{\circ}_{\text{Ag}^{+}/\text{Ag}} = +0.80\text{ V}$,

$E^{\circ}_{\text{Zn}^{2+}/\text{Zn}} = -0.76\text{ V}$

6. The resistance of 0.01 M NaCl solution at 25°C is 200Ω. The cell constant of the conductivity cell used is unity. Calculate the molar conductivity of the solution.

7. The electrical resistance of a column of 0.05M NaOH solution of diameter 1cm and length 50 cm is $5.55 \times 10^3 \Omega$. Calculate its resistivity, conductivity and molar conductivity.

8. Calculate $\Delta^{\circ}m$ for acetic acid,

Given that, $\Delta^{\circ}m(\text{HCl}) = 426\text{ S cm}^2\text{ mol}^{-1}$

$\Delta^{\circ}m(\text{NaCl}) = 126\text{ S cm}^2\text{ mol}^{-1}$

$$\Delta^0_{m(\text{CH}_3\text{COONa})} = 91 \text{ S cm}^2 \text{ mol}^{-1}$$

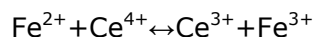
9. What type of battery is lead storage battery? Write the anode and cathode reactions, and the overall cell reaction occurring in the operation of a lead storage battery.
10. Calculate the strength of the current required to deposit 1.2g of magnesium from molten MgCl_2 in 1 h ($1F = 96500 \text{ C mol}^{-1}$, atomic mass of $\text{Mg} = 24.0$)
11. At what pH will hydrogen electrode at 298 K show an electrode potential of -0.118 V , when Hydrogen gas is bubbled at 1 atm pressure?
12. Zinc electrode is constituted at 298 K by placing Zn rod in 0.1 M aq solution of zinc sulphate which is 95 % dissociated at this concentration. What will be the electrode potential of the electrode given that $E^0_{\text{Zn}^{2+}/\text{Zn}} = -0.76 \text{ V}$.
13. State the relationship amongst cell constant of a cell, resistance of the solution in the cell and conductivity of the solution. How is molar conductivity of a solute related to conductivity of its solution?
14. A cell contains two hydrogen electrodes. The negative electrode is in contact with a solution of 10^{-6} M H^+ ions. The emf of the cell is 0.118 V at 298 K. Calculate the concentration of the H^+ ions at the positive electrode.
15. Electrolysis of the solution of MnSO_4 in aq sulphuric acid is a method for the preparation of MnO_2 as per the chemical reaction
$$\text{Mn}^{2+} + 2\text{H}_2\text{O} \rightarrow \text{MnO}_2 + 2\text{H}^+ + \text{H}_2$$
Passing a current of 27 A for 24 hrs gives 1 kg of MnO_2 . What is the current efficiency? What are the reactions occurring at anode and cathode?

5 marks Questions

1. a) Explain with example the terms weak and strong electrolytes.
b) Calculate the emf of the cell
$$\text{Mg} | \text{Mg}^{2+}(0.001\text{M}) || \text{Cu}^{2+}(0.001\text{M}) | \text{Cu}$$
$$E^0_{\text{Cu}^{2+}/\text{Cu}} = 0.34\text{V} ; E^0_{\text{Mg}^{2+}/\text{Mg}} = -2.375\text{V}$$
2. i) Define molar conductivity. Draw the plots showing the variation of molar conductivity for strong and weak electrolyte with square root of concentration.
(ii) Resistance of a solution (A) is 50 ohm and that of solution (B) is 100ohm, both solutions being taken in the same conductivity cell, if equal volumes of solutions (A) and (B) are mixed, what will be the resistance of the mixture, using the same cell? Assume that there is no increase in the degree of dissociation of (A) and (B) on mixing
3. i) State Faraday's first and second laws of electrolysis
4. ii) Silver is deposited on a metallic vessel of surface area 800 cm^2 by passing current of 0.2 ampere for 3 hours. Calculate the thickness of silver deposited. (Density of silver = 10.47 g cm^{-3} , Molar atomic mass of silver = $107.924 \text{ g mol}^{-1}$)

5. i) Draw the diagram of standard hydrogen electrode. Write the electrode reaction.

ii) Calculate the equilibrium constant for the reaction



Given, $E^0_{\text{Ce}^{4+}/\text{Ce}^{3+}} = 1.44\text{V}$; $E^0_{\text{Fe}^{3+}/\text{Fe}^{2+}} = 0.68\text{V}$

6. A voltaic cell is set up at 25°C with the half-cells



What should be its cell potential? ($E^0 = 0.46\text{V}$, $\text{Log } 10^5 = 5$)

7. Conductivity of 0.00241 m acetic acid solution is $7.896 \times 10^{-5}\text{ S cm}^{-1}$. Calculate its molar conductivity in this solution. If Δ^0_m for acetic acid be $390.5\text{ S cm}^2\text{ mol}^{-1}$, what would be its dissociation constant?

8. Three electrolytic cells A, B, and C containing solutions of zinc sulphate respectively, are connected in series. A steady current of 1.5A was passed through them until 1.45g of silver were deposited at the cathode of cell B. How long did the current flow? What mass of copper and what mass of Zinc were deposited in the concerned cells? (Atomic mass of $\text{Ag} = 108$, $\text{Zn} = 65.4$, $\text{Cu} = 63.5$)



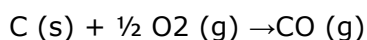
Chapter 4

Chemical Kinetics

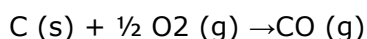
1mark Questions

1. What is the effect of temperature on activation energy?
2. Which will dissolve in water faster, powdered sugar or crystalline sugar and why?
3. Which reaction will take place faster and why?

500 °C



1000 °C



4. The half-life period of two samples is 0.1 and 0.4 seconds. Their initial concentrations are 200 and 50 mol L⁻¹ respectively. What is the order of reaction?
5. Higher molecularity reactions (viz. molecularity, 4 and above) are very rare. Why?
6. How is half life time related to initial conc. for a second order reaction?
7. Consider the reaction $2\text{A} + \text{B} \rightarrow \text{Products}$. When concentration of B alone was doubled, half life time does not change. When conc. of A alone doubled, the rate increases by two times. What are the units of K and what is the order of reaction?
8. For a reaction $\text{A} + \text{H}_2\text{O} \rightarrow \text{B}$; $r = k [\text{A}]$. What is its (i) Molecularity (ii) Order
9. What is rate of reaction?
10. Why rate of reaction does not remain constant?
11. What will be the order of reaction, if the rate of reaction does not depend on the concentration of any of the reactant?
12. Define activation energy
13. In some cases, it is found that a large number of colliding molecules have energy more than threshold energy, yet the reaction is slow. Why?
14. Write the unit of first order rate constant of a gaseous reaction if the partial pressure of gaseous reactant is given in bar
15. What is the value of the order of reaction of radioactive decay?
16. Express the relation between the half life period of a reactant and initial concentration for a reaction of nth order
17. For a chemical reaction, activation energy is zero and at 300K rate constant is $5.9 \times 10^{-5} \text{ s}^{-1}$, what will be the rate constant at 400K?
18. Two reactions occurring at the same temperature have identical values of E_a . Does this ensure that also they will have the same rate constant? Explain.

2 marks Questions

- For a reaction, the activation energy is zero. What is the value of rate constant at 300 K if $k = 1.6 \times 10^6 \text{ s}^{-1}$ at 280 K.
- The slope of the line in the graph of $\log K$ is for a reaction is -5841 K . Calculate E_a for the reaction.
- List four factors which affect the rate of a chemical reaction. State how each of these factors changes the reaction rate.
- Differentiate between
 - Average rate and instantaneous rate of a chemical reaction.
 - Rate of a reaction and specific rate of reaction, i.e., rate constant
- The rate law for the reaction : $A + B \rightarrow P$ is given by
$$\text{Rate} = k [A]^n [B]^m$$

On doubling the concentration of A and reducing the concentration of B to half of its original concentration, calculate the ratio of the new rate to the previous rate of reaction
- Explain with an example, what is a pseudo first order reaction?
- Show that time required for 99.9% completion of the first order reaction is 10 times of $t_{1/2}$ for first order chemical reaction
 - For a reaction $A + B \rightarrow \text{Products}$, the rate law is given by $r = k [A]^{1/2} [B]^2$. What is the order of reaction?
 - The conversion of molecules X to Y follows second order kinetics. If concentration of X is increased to three times, how will it affect the rate of formation of Y?
- The rate of a particular reaction quadruples when the temperature changes from 293K to 313K. Calculate activation energy
- If the decomposition of nitrogen oxide as
 $2\text{N}_2\text{O}_5 \rightarrow 4\text{NO}_2 + \text{O}_2$ follows a first order kinetics. Calculate the rate constant for a 0.05 M solution if the instantaneous rate is $1.5 \times 10^{-6} \text{ mol/l/s}$
- Write the difference between order and molecularity of reaction.
- Define Threshold energy and activation energy. How they are related?
- Draw a schematic graph showing how the rate of a first order reaction changes in concentration of reactants.
 - rate of reaction is given by the equation $\text{Rate} = k [A]^2 [B]$. What are the units of rate constant for this reaction?
- What is half-life period? Derive an expression for half-life period in case of a first order reaction
- What are Pseudo unimolecular reactions? Explain with the help of a suitable example.
- Distinguish between rate expression and rate constant of a reaction.
- For a chemical reaction, what is the effect of a catalyst on the
 - Activation energy of the reaction
 - Rate constant of the reaction

17. What do you mean by elementary slip of reaction?
18. What is the difference between average rate and instantaneous rate of chemical reaction
19. A reaction is of first order in reactant A and of second order in reactant B. How is the rate of this reaction affected when
- the concentration of B as alone is increased to three times
 - The concentration of A as well as B are doubled
20. A reactant has a half-life of 10 minutes
- calculate the rate constant for the first order reaction
 - What fraction of the reactant will be left after an hour of the reaction has occurred
21. The rate constant for a zero order reaction in A is $0.0030 \text{ mol}^{-1}\text{L}^{-1}\text{s}^{-1}$. How long will it take for the initial concentration of A to fall from 0.10M to 0.075M?
22. Define
- Specific rate of reaction\
 - Energy of activation of a reaction
23. With the help of a diagram, explain the role of activated complex in a reaction.
24. The rate of reaction becomes four times when the temperature changes from 300K TO 320K. Calculate the energy of activation of the reaction, assuming that it does not change with temperature. ($R=8.314\text{K}^{-1} \text{ mol}^{-1}$)

3marks questions

- A heterogeneous reaction is carried out at 500 K. If the same reaction is carried out in the presence of catalyst at the same rate, the temperature requires is 400 K, calculate the activation energy of the reaction if the catalyst lowers the activation barrier by 20 KJ/mol.
- A reaction is second order in A and first order in B
 - Write the differential rate reaction
 - How is the rate affected on increasing the concentration of A three times
 - How is the rate affected when the concentrations of both A and B are doubled
- For the reaction,
 $2\text{NO}(\text{g}) + \text{Cl}_2(\text{g}) \rightarrow 2\text{NOCl}(\text{g})$

The following data were collected. All the measurement were taken at 263K

Exp. No	Initial (NO)(M)	Initial (Cl ₂)(M)	Initial rate of disappearance of Cl ₂ (M/min)
1.	0.15	0.15	0.60
2.	0.15	0.30	1.20
3.	0.30	0.15	2.40
4.	0.25	0.25	?

- i) Write the expression for the rate law
 - ii) Calculate the value of rate constant and specify its unit
 - iii) What is the initial rate of disappearance of Cl_2 in experiment 4?
4. 50% of the original amount of a reactant was added to the reaction mixture after 40 min. What % of the total amount will be present after 60 min, given that half-life period of the reaction is 20 min.
 5. The activation energy for the reaction: $2\text{HI}(\text{g}) \rightarrow \text{H}_2(\text{g}) + \text{I}_2(\text{g})$ is 209.5kJ/mol at 581 K. Calculate the fraction of molecule of reactants having energy equal to or greater than activation energy.
 6. For the reaction, the energy of activation is 75kJ/mol . When a catalyst is added the reaction its energy of activation is lowered to 20kJ/mol . What is the effect of catalyst on the rate of reaction at 20°C ?
 7. The gas phase decomposition of CH_3OCH_3 follows first order kinetics
 $\text{CH}_3\text{OCH}_3 \rightarrow \text{CH}_4(\text{g}) + \text{H}_2(\text{g}) + \text{CO}(\text{g})$
 The reaction is carried out in a constant volume container at 500°C and has $t_{1/2} = 14.5$ min. Initially only dimethyl ether is present at a pressure of 0.40 atm. What is the total pressure of the system after 12 min? Assume ideal behavior.
 8. A first order reaction takes 100 min. for completion of 60% of the reaction. Find the time when 90% of the reaction will be completed.
 9. A first order reaction has a rate constant value of 0.00510 min^{-1} . If we begin with 0.10M concentration of the reactant, how much of the reactant will remain after 3.0h?
 10. The decomposition of a compound is found to follow a first order rate law. If it takes 15 min to 20% of original material to react,
 Calculate
 - i) the rate constant
 - ii) The time at which 10% of the original material remains unreacted.
 11. The half-life for decay of radioactive ^{14}C is 5730yr. An archaeological artifact containing wood had only 80% of the ^{14}C found in a living tree. Estimate the age of the sample.
 12. For a decomposition reaction, the values of rate constant k at two different temperatures are given below
 $K_1 = 2.15 \times 10^{-8}\text{ L mol}^{-1}\text{ s}^{-1}$ at 650K
 $K_2 = 2.39 \times 10^{-7}\text{ mol}^{-1}\text{ s}^{-1}$ at 700K
 Calculate the value of activation energy for this reaction ($R = 8.314\text{ JK}^{-1}\text{mol}^{-1}$)
 13. The decomposition of A into products has a value of k as $4.5 \times 10^3\text{ s}^{-1}$ at 10°C and energy of activation 60 kJ mol^{-1} . At what temperature would it be $1.5 \times 10^4\text{ s}^{-1}$?

Chapter 5

Surface Chemistry

1 mark Questions

1. Why is it necessary to remove carbon monoxide when ammonia is obtained from Haber's process?
2. In the titration of oxalic acid by acidified KMnO_4 , the oxidation of oxalic acid is slow in the beginning but becomes fast as the reaction progresses. Why?
3. The conductance of an emulsion increases on adding common salt. What type of emulsion is it?
4. What is syneresis or weeping of gels?
5. Out of PO_4^{3-} , SO_4^{2-} , Cl^- , which will act as the best coagulating agent for $\text{Fe}(\text{OH})_3$?
6. Arrange the following in correct order of their coagulating power :
 Na^+ , Al^{3+} , Ba^{2+}
7. How does BF_3 act as a catalyst in industrial process?
8. Silicate garden is developed by setting of colored ions in the void of silicates. It is a case of-----?
9. What is purple of casius?
10. Which type of metals act as effective catalysts?
11. What causes brownian movement in a colloidal solution?
12. At high pressure, the entire metal surface gets covered by a mono molecular layer of the gas. What is the order of the process?
13. What are enzymes?
14. The colloidal solution of gold prepared by different methods has different colors. Why?
15. The formation of micelles occurs only beyond a certain temperature. What is the temperature called?
16. What is the shape-selective catalysis?
17. What is the unit for expressing flocculation value?
18. Most effective electrolyte causing the coagulation of negatively charged As_2S_3 solution is a) MgCl_2 b) KCl c) $\text{K}_3[\text{Fe}(\text{CN})_4]$ d) Na_2SO_4 ?
19. What are dispersed phase and dispersion medium in milk?
20. Define Peptisation?
21. Define the term tyndall effect?
22. What is coagulation process?
23. What is the effect of temperature on Chemisorption?
24. What is desorption and Chemisorption?
25. What is physisorption? Why does it decrease with the increase of temperature?
26. Why is finely divided substance more effective as absorbent?
27. What are the physical states of dispersed phase and dispersion medium of froth?
28. Why is it necessary to remove CO when ammonia is obtained by Haber's process?
29. On passing H_2S through dilute HNO_3 the colorless solution becomes turbid. Why?
30. What happens to a gold sol if gelatin is added to it?

2 marks Questions

1. Explain the curdling of milk when it is sour.
2. The layer of fat in the pans used for manufacturing soaps can be removed by adding boiling washing soda solution. How will you account for it?
3. Bleeding is stopped by the application of alum to a wound. Why ?
4. Dialysis is a method of purification of sols. But prolonged dialysis of the sol makes it unstable. Why?
5. Why artificial rain can be caused by throwing common salt on the clouds? Explain.
6. Critical temperatures of N_2 , CO and CH_4 are 126, 134 and 190 K respectively, Arrange them in increasing order of adsorption on the surface of charcoal. Give reason.
7. Which of the following has minimum coagulating value? Why?
a) $NaCl$ b) $BaCl_2$ c) $Al_2(SO_4)_3$ d) KCl
8. Addition of H_2 to acetylene gives ethane in presence of palladium but if $BaSO_4$ and quinoline or sulphur is also added, the product is ethane. Why?
9. Why physical adsorption is multimolecular whereas chemisorption is unimolecular?
10. What is meant by induced catalysis ? Give an example.
11. What type of colloidal sols are formed in the following ?
(i) Sulphur vapours are passed through cold water.
(ii) White of an egg is mixed with water.
(iii) Concentration of soap solution is increased
12. Distinguish between homogenous and heterogeneous catalysis. What role does adsorption play in homogenous catalysis
13. What is the difference between oil in water and water in oil type emulsion? Give an example of each type?
14. What are lyophilic and lyophobic colloids? Which of these sols can be easily coagulated on the addition of small amounts of electrolytes and why?
15. Explain the difference between multimolecular and macromolecular colloids with example?
16. What are emulsions? State one application of emulsification.
17. Describe conspicuous change observed when
18. i) a solution of $NaCl$ is added to a sol of hydrated ferric oxide
ii) a beam of light is passed through a solution of $NaCl$ and then through a sol.
19. Write the differences between physisorption and chemisorption with respect to the following
a) Specificity
b) Temperature dependence
c) Reversibility
d) Enthalpy change
20. How adsorption occurs in
a) Production of high vacuum

b) Heterogeneous catalysis

21. How are following colloidal solutions prepared

a) Sulphur in water

b) Gold in water

22. Explain as to why SnO_2 forms a positively charged sol in solutions with $\text{pH} < 7$ and negatively charged sol in solutions with $\text{pH} > 7$.

3 marks Questions

1. What is an adsorption isotherm? Describe Freundlich adsorption isotherm.
2. Discuss the effect of pressure and temperature on the adsorption of gases and solids. Describe the application of adsorption in controlling humidity
3. Explain with examples, How the two types of processes of adsorption (physisorption and chemisorption) are influenced by the prevailing temperature, the surface area of adsorbent and the activation energy of the process?
4. In order to coagulate a fixed amount of As_2S_3 sol how will NaCl , MgCl_2 and AlCl_3 vary in their activity? Explain with the help of related rule.
5. The volume of nitrogen gas (measured at STP) required to cover a sample of silica gel with a monomolecular layer is $129\text{cm}^3/\text{g}$ of gel. Calculate the surface area per gram of the gel if each nitrogen molecule occupies $16.2 \times 10^{-20}\text{ m}^2$.
6. To the aqueous solution of a salt taken in a tube, a few drops of blue litmus solution were added. Ammonia solution was added drop wise to the red solution formed till it regained its blue color. The solution was then heated for some time and the tube was left undisturbed. A blue mass was seen floating in colorless solution. How will you account for this? Identify the tentative salt.
7. Define:
 - i) Sorption
 - ii) Electrophoresis
 - iii) Sol
8. With suitable examples, distinguish between homogenous solution, a suspension and a colloidal solution.
9.
 - i) Write the expression for the Freundlich adsorption isotherm for the adsorption of gases on solids, in the form of an equation
 - ii) What are the dispersed phase and dispersion medium of butter?
 - iii) A delta is formed at the meeting place of sea and river water. Why?
10. Explain what is observed when:
 - i) An electric current is passed through a sol
 - ii) A beam of light is passed through a sol?
 - iii) An electrolyte is added to ferric hydroxide sol?

11. What happens :

- (a) By persistent dialysis of a sol.
- (b) When river water meets the sea water.
- (c) When alum is applied on cuts during bleeding.



Chapter 6

General Principles and Processes of Isolation of Elements

1 mark Questions

1. What role does Zinc play in the extraction of Silver
2. Name three metals which occur in native state in nature
3. What are collectors in froth flotation process? Give one example
4. Among Fe, Cu, Al and Pb, which metal (s) cannot be obtained by smelting
5. Give the names and formulae of three ores which are concentrated by froth floatation process.
6. What is the thermodynamic criterion for the feasibility of a reaction?
7. Why can't aluminum be reduced by carbon?
8. Name the most important form of iron. Mention its one use.
9. Name the impurities present in bauxite ore
10. What are the constituents of German silver?
11. What is the composition of copper matte?
12. A sample of galena is contaminated with zinc blend. Name one chemical which can be used to concentrate galena selectively by froth floatation method
13. What are froth stabilizers? Give two examples.
14. Why is froth floatation process selected for concentration of the sulphide ore?
15. Write the composition of molten mixture which is electrolyzed to extract aluminum
16. Although aluminum is above hydrogen in the electrochemical series, it is stable in air and water. Why?
17. Why carbon reduction process is not applied for reducing aluminium oxide to aluminum?
18. What is the function of SiO_2 in the metallurgy of copper?
19. Define pyrometallurgy?
20. Differentiate mineral and ore?
21. Explain why thermite process is quite useful for repairing the broken parts of a machine?
22. Graphite is used as anode and not diamond. Assign reason.
23. What is Self-Electronation?
24. What are the oxidation states of iron in Fe_3O_4 ?
25. Name an ore having two different metal ions
26. Which Substance is added to molten iron to remove sulphur impurity?
27. What is "18:8 stainless steel"?
28. Why copper matte is put in silica lined converter?
29. What are depressants?
30. Copper can be extracted by hydrometallurgy but not Zn. Why?

2 marks questions

1. What is the difference between reverberatory furnace & blast furnace?
2. Why thermite process is not used for obtaining aluminum from bauxite.
3. How does NaCN act as a depressant in preventing zinc from forming the froth? Explain.
4. What is Zone Refining? Explain with example
5. Write the principal of electro-refining
6. Describe the method of refining of nickel.
7. Write difference between calcination and roasting.
8. Describe the method of refining of Zirconium and Titanium.
9. What is meant by term chromatography?
10. Why is reduction of metal oxide easier if metal formed is in liquid state at temperature of reduction?
11. Out of C & CO, which is better reducing agent for ZnO?
12. What is hydrometallurgy? Give one example where it is used for metal extraction.
13. Write the method to produce Copper matte from copper pyrites.
14. Name the process for the benefaction/concentration of (i) an ore having lighter impurities (ii) sulphide ore
15. Mention the role of cryolite in the extraction of aluminum
16. The graphite electrodes in the extraction of 'aluminum' by Hall-Heroult process need to be changed frequently. Why?
17. Write the chemical formulae of the following ores (a) Haematite (b) Magnetite (c) Limonite (d) Siderite
18. Give equations for the industrial extraction of zinc from calamine
19. Why is the reduction of a metal oxide easier if metal formed is in liquid
20. state at the temperature of reduction?
21. Write the Chemical reactions taking place in different zones in the blast furnace for the extraction of iron from its ore
22. Name the elements present in anode mud during refining of copper. Why does it contain such elements?
23. How are impurities separated from bauxite ore to get pure alumina?
24. Describe the process involved in each of the following processes
 - i) Mond process for refining of nickel
 - ii) Column chromatography for purification of rare elements.
25. State the basis of refining a substance by chromatographic method. Under what circumstances is this method especially useful?

3marks questions

1. Give the reducing technique of a covalent metal compound, by giving all necessary equations
2. What is red mud in the metallurgy of aluminum? And explain all the steps involved in the concentration of ore of aluminum with necessary equations
3. The extraction of gold by leaching with NaCN involves both oxidation and reduction. Justify giving equations.
4. Cinnabar and Galena on roasting often give their respective metals but Zinc blende does not. Explain.
5. State the principles of refining of metal by the following methods.
(a) Zone refining (b) Electrolytic refining (c) Vapor phase refining.
6. How pure copper is obtained from its principle ore? Write the chemical reactions occurring during the extraction.
7. In the cyanide extraction process of silver from argentite ore, name the oxidising and reducing agents. Write the chemical equations of the reactions involved.
8. Explain the following:-
 - (i) Zinc but not copper is used for recovery of Ag from the complex $[\text{Ag}(\text{CN})_2]^-$.
 - (ii) Partial roasting of sulphide ore is done in the metallurgy of copper.
 - (iii) Extraction of Cu from pyrites is difficult than that from its oxide ore through reduction.
9. Explain the method for obtaining pig iron from magnetite.
10. Name the principal ore of aluminium and describe how Al is extracted from its ore.
11. Describe the principles of extraction of Zinc from zinc blende
12. Write down the reactions which occur in upper, middle and lower zones in the blast furnace during the extraction of iron?

Chapter 7

The p-Block Elements

1 mark Questions

1. Why nitrogen gas is unreactive
2. Why is the single N-N bond weaker than the single P-P bond?
3. PCl_3 fumes in moist air. Why?
4. Draw the structure of PCl_5 .
5. P_4O_{10} is used as dehydrating agent. Why?
6. Oxygen and Sulphur exhibit -2 oxidation state where as others (Se, Te) exhibit $+2$ oxidation states.
7. Chemical methods are not practicable for the preparation of Fluorine
8. Why H_2SO_4 is not used for the preparation of HBr from NaBr
9. Iodine forms I_3^- ion but F_2 does not form F_3^- ion. Why?
10. NH_3 has a higher proton affinity than PH_3 . Explain
11. Bleaching of flowers by chlorine is permanent while that by sulphur dioxide is temporary. Why?
12. Iodine is more soluble in KI , than H_2O .
13. What is the basicity of H_3PO_2 and why?
14. Ammonia is more basic than phosphine?
15. Nitrogen does not form pentahides although it exhibits $+5$ oxidation states. Explain.
16. Write the chemical reaction for involved when orthophosphorus acid is heated
17. Why does NO_2 dimerise?
18. In solid state, why does PCl_5 behaves as an ionic species
19. Complete the following chemical reaction
 $\text{HgCl}_2 + \text{PH}_3 \rightarrow$
20. The basic character of the hydrides of group 15 element decreases with increasing atomic numbers. Why?
21. What happens when white phosphorus is heated with conc. NaOH solution in an inert gas atmosphere?
22. Why is BiH_3 the strongest reducing agent amongst all the hydrides of group 15 elements?
23. Why does oxygen shows less catenation behavior than Sulphur?
24. Sulphur in vapor state exhibits paramagnetic behavior. Give Reason.
25. Sulphur hexafluoride is less reactive than Sulphur tetrafluoride. Why?
26. O_6 compound is not known. Why?
27. Hydrogen fluoride has much higher boiling point than hydrogen chloride. Why?
28. Write the balanced chemical equation for the following reaction:
Excess of SO_2 reacts with sodium hydroxide solution
29. H_2O is a liquid while, in spite of higher molecular mass, H_2S is gas. Explain.
30. Draw the structure of SF_4 MOLECULE?

31. The value of electron gain enthalpy with negative sign for Sulphur is higher than that for oxygen Give reason?
32. F_2 is a stronger oxidizing agent than Cl_2 .
33. Draw the structure of BrF_3 molecule.
34. Why is ICl more reactive than I_2 ?
35. O_2 and F_2 both stabilize higher oxidation states of metals but O_2 exceeds F_2 in doing so.
36. What happens when chlorine gas is passed through a hot concentrated solution of $NaOH$ Halogens are strong oxidizing agents? Why?
37. Iron dissolves in HCl to form $FeCl_2$ but not $FeCl_3$?
38. How are interhalogen compounds formulated and how are they prepared?
39. Which is stronger acid in aqueous solution, HCl or HI and why?
40. Why do noble gases have comparatively large atomic sizes?
41. Draw the structure of $XeOF_4$ molecule.
42. Helium forms no real chemical compound. Why?
43. Noble gases are least reactive elements. Why?
44. How does xenon form compounds even though the xenon atom has a closed shell electronic configuration?
45. Why do noble gases form compounds with fluorine and oxygen only?
46. XeF_2 is linear without a bent?
47. What happens when XeF_6 is hydrolysed?

2 marks Questions

1. What happens when
 - i) PCl_5 is heated
 - ii) H_3PO_3 is heated
 Write the reactions involved.
2. Draw the structures of white phosphorus and red phosphorus. Which one is more reactive and why?
3. Complete the following chemical reaction
 - i) $I_2 + \text{conc. } HNO_3 \rightarrow$
 - ii) $HgCl_2 + PH_3 \rightarrow$
4. When a moist blue litmus paper is dipped in a solution of hypochlorous acid, it first turns red and then later gets decolorized. Why?
5. Oxides of Nitrogen have open chain structure while those of phosphorous have closed chain or cage structure. Why is it so? Illustrate with one structural example for each type of oxide or the oxides of phosphorous have cage structure but not open ones.
6. Iodine is liberated when KI is added to a solution of Cu^{2+} ions but Cl_2 is not liberated when KCl is added to a solution of Cu^{2+} ions. Why? Explain.

7. State the reasons
 - i. ClF_3 exists but FCl_3 does not
 - ii. BH_4^- and NH_4^+ are isolobal
8. Why is it important to add KF in HF and exclude moisture during electrolysis of HF for the preparation of Fluorine?
9. Why SO_2 is a better reducing agent in alkaline medium as compared to that in acidic medium? Explain
10. Name the two important allotropes of Sulphur. Which one of the two is stable at room temperature? What happens when the stable form is heated above 370K ?
11. Draw the structure of O_3 and O_8 molecule?
12. Account for the following
 - i) H_2S is less acidic than H_2Te .
 - ii) SO_2 is an air pollutant.
13. How are interhalogen compounds formed? What general compositions can be assigned to them?
14. Complete the following chemical reactions:
 - i) $\text{P}_4 + \text{SOCl}_2 \rightarrow$
 - ii) $\text{F}_2(\text{excess}) + \text{Cl}_2 \rightarrow$
15. Write the formula and the structure of noble gas species which are isostructural with
 - i) ICl_4^-
 - ii) BrO_3^-

3marks questions

1. Write the balanced chemical equations for obtaining XeO_3 and XeOF_6 from XeF_6 .
2. Account for the following:
 - (i) Chlorine water has both oxidizing and bleaching properties
 - (ii) H_3PO_2 and H_3PO_3 act as good reducing agents while H_3PO_4 does not.
 - (iii) On adding of ozone gas to KI solution, violet vapours are obtained
3. A translucent white waxy solid (A) on heating in an inert atmosphere is converted into its allotropic form (B). Allotrope (A) on reaction with very dilute aqueous KOH liberates a highly poisonous gas (C) having rotten fish smell. With excess of chlorine (C) forms (D) which hydrolyses to compound (E). Identify A to E
4. An element 'A' exists as a yellow solid in standard state. It forms a volatile hydride 'B' which is a foul smelling gas and is extensively used in qualitative analysis of salts. When treated with oxygen, 'B' forms an oxide 'C' which is a colorless, pungent smelling gas. This gas when passed through acidified KMnO_4 solution, decolorizes it, 'C' gets oxidized to another oxide 'D' in the presence of a heterogeneous catalyst. Identify A, B, C, D and also give the chemical equation of reaction of 'C' with KMnO_4 solution and for conversion of 'C' to 'D'.

5. Element A burns in nitrogen to give an ionic compound B. The compound B reacts with water to give C and D. A solution of C becomes milky on bubbling carbon dioxide. Identify A, B, C and D. And write the balanced equations.
6. Account for the following
 - i) H_3PO_2 has reducing nature
 - ii) Phosphorus shows high tendency of catenation
 - iii) Nitrogen found in gaseous state.
7. Explain:
8. i) Nitrogen is much less reactive than phosphorus
 ii) The stability of ± 5 oxidation state decreases down the group 15.
 iii) The bond angles (O-N-O) are not of the same value in NO_2^- and NO_2^+ .
9. Give reasons for the following
 - i) $(\text{CH}_3)_3\text{P}=\text{O}$ exists but $(\text{CH}_3)_3\text{N}$ does not.
 - ii) Oxygen has less electron gain enthalpy with negative sign than sulphur
 - iii) H_3PO_2 is a stronger reducing agent than H_3PO_3 .
10. Account for the following
 - i) PCl_5 is more covalent than PCl_3
 - ii) Iron on reaction with HCl forms FeCl_2 and not FeCl_3 .
 - iii) The two O-O bond lengths in the ozone molecule are equal.

5 marks questions

1. a) How is ammonia prepared on a large scale? Name the process and mention the optimum conditions for the production of ammonia by this process
 b) Assign reasons for the following
 - i) H_2S is more acidic than H_2O .
 - ii) NH_3 is more basic than PH_3 .
 - iii) Sulphure has greater catination tendency than oxygen
2. i) Complete the following chemical equations:
 - $\text{P}_4 + \text{NaOH} + \text{H}_2\text{O} \rightarrow$
 - $\text{XeF}_4 + \text{O}_2\text{F}_2 \rightarrow$
 ii) How would you account for the following situations?
 - The acidic strength of these compounds increases in the following order $\text{PH}_3 < \text{H}_2\text{S} < \text{HCl}$
 - The oxidizing power of oxacids of chlorine follows the order:
 $\text{HClO}_4 < \text{HClO}_3 < \text{HClO}_2 < \text{HClO}$
 - In vapour state, sulphur exhibits paramagnetic behavior.
3. i) Using VESPR theory, predict the probable structures of the following
 - N_2O_3

- BrF_3

ii) Arrange the following groups of substances in the order of the property indicated against each group:

- $\text{NH}_3, \text{PH}_3, \text{AsH}_3, \text{SbH}_3$ - increasing order of boiling points
- O, S, Se, Te- increasing order of electron gain emphy with negative sign
- $\text{F}_2, \text{Cl}_2, \text{Br}_2, \text{I}_2$ - increasing order of bond dissociation enthalpy

4. i) Account for the following:

- a) Bi is a strong oxidizing agent in ± 5 oxidation state
- b) PCl_5 is known but NCl_5 is not known.
- c) Iron dissolves in HCl to form FeCl_2 and not FeCl_3 .

ii) Draw the structures of the following:

- XeO_4
- HClO_4

5. i) Draw the structures of the following:

- $\text{H}_2\text{S}_2\text{O}_8$
- Red P_4

ii) Account for the following

- Sulphur in vapour state exhibits paramagnetism
- Unlike Xenon, no distinct Chemical compound of helium is known
- H_3PO_2 is a stronger reducing agent than H_3PO_3 .

6. i) Draw the structures of the following:

- $\text{H}_2\text{S}_2\text{O}_7$
- Solid PCl_5
- N_2O_5

ii) Arrange the following in the order of property indicated against each set.

- HF, HCl, HBr, HI (increasing bond dissociation enthalpy)
- $\text{H}_2\text{O}, \text{H}_2\text{S}, \text{H}_2\text{Se}, \text{H}_2\text{Te}$ (increasing acidic character)

Chapter 8

The d- and f- Block Elements

1 mark Questions

1. Why is that orange solution of $K_2Cr_2O_7$ turns yellow on adding NaOH ?
2. Arrange CrO , CrO_3 and Cr_2O_3 in increasing order of acidic strength.
3. Why does Ti^{4+} ion show diamagnetic nature?
4. Which metal in the first series of transition metal exhibits +1 oxidation state most frequently and why?
5. Which element of the first transition series shows the highest number of oxidation states?
6. $K_2[PtCl_6]$ is a well-known compound, Whereas the corresponding Ni compound is not known. State a reason for it.
7. Why does vanadium pentoxide act as a catalyst?
8. Why hydrated $CuSO_4$ is blue while its anhydrous form is colourless.
9. Why is HCl not used to acidify a permanganate solution in volumetric estimation of Fe^{2+} and oxalate ion.
10. Sc^{3+} is more stable than Sc^{2+} . Why?
11. Why $KMnO_4$ is bright in colour?
12. Why do transition elements show variable oxidation states?
13. Why Copper(I) ion is not known in aqueous solution
14. Many of the transition elements are known to form interstitial compounds. Why?
15. Write the electronic configuration of Cr^{3+} ion (atomic number of Cr = 24)
16. Why is the third ionisation energy of Manganese (Z = 25) is unexpectedly high?
17. Which metal in the first series of transition metal exhibits +1 oxidation state most frequently and why?
18. Mention one consequence of Lanthanoid Contraction?
19. Why Mn^{2+} compounds are more stable than Fe^{2+} compounds towards oxidation to their +3 state?
20. The transition metals and their compounds are known for their catalytic activity. Give two specific reasons to justify the statement
21. What are interstitial compounds?
22. Mention the name and formula of the ore from which potassium dichromate is prepared
23. What is the most common oxidation state of actinoids?
24. Name one ore each of manganese and chromium
25. Why is Cd^{2+} ion white?
26. Draw the structure of dichromate anion
27. Arrange the following monoxides of transition metals on the basis of decreasing basic character TiO , VO , CrO , FeO . [Hint : $TiO > VO > CrO > FeO$]
28. The enthalpies of atomization of transition metals are quite high.
29. Lanthanum and lutetium do not show colouration in solutions.
30. Why do actinoids, in general, exhibit a greater range of oxidations states than the lanthanoids?

31. The metallic radii of the third(5d) series of transition metals are virtually the same as those of the corresponding group member of the second(4d) series.

2 marks questions

1. The stability of $\text{Cu}^{2+}(\text{aq})$ is more than that of $\text{Cu}^+(\text{aq})$. Why?
2. Describe the general trends in the following properties of the first series(3d) of the transition elements
 - Number of oxidation states exhibited
 - Formation of oxo metal ions.
3. Write the chemical equation, when the yellow colour of aqueous solution of Na_2CrO_4 changes to orange on passing CO_2 gas?
4. Why is copper (I) sulphate diamagnetic and Copper (II) Sulphate paramagnetic? Explain
5. HgCl_2 , SnCl_2 , cannot exist together in an aqueous solution. Why?
6. Describe giving reason which one of the following pairs has the property indicated and why?
 - Fe or Cu has higher melting point
 - Co^{2+} or Ni^{2+} has lower magnetic moment
7. Indicate the steps in the preparation of
 - $\text{K}_2\text{Cr}_2\text{O}_7$ from Chromite ore.
 - KMnO_4 from Pyrolusite ore.
8. Give reason for : -
 - In permanganate ions, all bonds formed between manganese and oxygen is covalent.
 - Permanganate titrations in presence of hydrochloric acid are unsatisfactory.
9. Why
 - transition metals show high melting points?
 - Fe has higher melting point due to presence of more unpaired electrons 3d-orbitals
10. Of the ions Co^{2+} , Sc^{3+} , Cr^{3+} which one will give colourless aqueous solution and how will each of them respond to magnetic field and why
11. Why Hg(I) ion exist as Hg_2^{2+} ion while Cu(1) ion exist as Cu^{1+} . Explain
12. A serious accident took place in a laboratory when a student tried to dissolve KMnO_4 in conc. Sulphuric acid instead of dil. Sulphuric acid. What went wrong? Explain
13. Account for the following :
 - Copper shows its inability to liberate hydrogen gas from the dilute acids
 - Scandium ($Z = 21$) does not exhibit variable oxidation states
14. Copper (I) compounds undergo disproportionation. Write the chemical equation for the reaction involved and give reason.
15. Calculate the number of moles of KMnO_4 that is needed to react completely with one mole of sulphite ion in acidic medium

16. Titanium shows magnetic moment of 1.73 BM in its compound. What is the oxidation number of Ti in the compound?
17. Explain
- Why zinc is not regarded as transition element?
 - Metal bonding is more frequent for the 4d and 5d-series transition metals than that for the 3d-series.
18. Explain the following observations
- Among the divalent cations in the first series of transition elements, manganese exhibits the maximum paramagnetism
 - Cu^+ ion is not known in aqueous solution
19. Assign reasons for the following:
- The transition elements have great tendency for complex formation
 - There is a greater horizontal similarity in the properties of the transition elements than of the main group elements
20. Complete the following chemical reactions:
- $\text{Cr}_2\text{O}_7^{2-}(\text{aq}) + \text{C}_2\text{O}_4^{2-}(\text{aq}) + \text{H}^+(\text{aq}) \rightarrow$
 - $\text{MnO}_4^- + \text{Fe}^{2+}(\text{aq}) + \text{H}^+(\text{aq}) \rightarrow$
21. What is the effect on the chemistry of the elements which follow the lanthanoids? Name an important alloy which contains some of the Lanthanoid metals.
22. Use Hund's rule to derive the electronic configuration of Ce^{3+} ion and calculate its magnetic moment by using 'spin only' formula. (Atomic number of Ce is 58)
23. Calculate the number of electrons transferred in each case when KMnO_4 acts as an oxidising agent to give (i) MnO_2 (ii) Mn^{2+} (iii) $\text{Mn}(\text{OH})$ (iv) MnO_4^{2-} respectively.

3marks questions

1. An aqueous blue coloured solution of a transition metal sulphate reacts with H_2S in acidic medium to give a black precipitate (A) which is insoluble in warm aqueous solution of KOH . The blue solution on treatment with KI in weakly acidic medium turns yellow and produces a white precipitate (B). Identify the transition metal ion; write the chemical reaction involved in the formation of A and B.
2. State the reasons for the following:
- Mercury is transported in iron containers.
 - $\text{Ce}(\text{III})$ is readily oxidized to $\text{Ce}(\text{IV})$
 - Actinoids have a stronger tendency to form complexes than lanthanoids
3. Describe the oxidising action of potassium dichromate with following. Write ionic equations for its reaction with.
- (a) Iodide ion (b) Iron (II) (c) H_2S
4. Account for the following:
- $\text{La}(\text{OH})_3$ is more basic than $\text{Lu}(\text{OH})_3$

- Zn^{2+} salts are white.
 - Cu(I) compounds are unstable in aqueous solution and undergo disproportionation
- A metal oxide of iron and chromium is fused with sodium carbonate in the presence of air to form a yellow colour compound A. on acidification, the compound A forms an orange coloured compound B which is a strong oxidizing agents. Identify the compounds A and B and write balanced equations for each step.
 - When a white crystalline compound X is heated with $\text{K}_2\text{Cr}_2\text{O}_7$ and conc. H_2SO_4 , a reddish brown gas A is evolved. On passing A into caustic soda solution, a yellow coloured solution of B is obtained. Neutralizing the solution B with acetic acid and on subsequent addition of lead acetate, yellow ppt. C is obtained. When X is heated with NaOH solution, a colorless gas is evolved and on passing the gas into K_2HgI_4 solution, a reddish brown ppt. D is obtained. Identify A, B, C, D and X. write the equations of the reactions involved
 - In the following reaction, Mn(VI) changes to Mn(VII) and Mn(IV) in acidic solution.

$$\text{Mn}^{\text{VI}}\text{O}_4^{2-} + 4\text{H}^+ \square\square \rightarrow 2\text{Mn}^{\text{VII}}\text{O}_4^- + \text{Mn}^{\text{IV}}\text{O}_2 + 2\text{H}_2\text{O}$$
 - Explain why Mn(VI) changes to Mn(VII) and Mn(IV)
 - What special name is given to such type of reactions?
 - An aqueous solution of a compound (A) is acidic towards litmus and (A) sublimes at about 3000°C . (A) on treatment with an excess of NH_4SCN gives a red coloured compound (B) and on treatment with a solution of $\text{K}_4(\text{Fe}(\text{CN})_6)$ gives a blue coloured compound (C). (A) on heating with excess of $\text{K}_2\text{Cr}_2\text{O}_7$ in the presence of concentrated H_2SO_4 evolves deep red vapour of (D). On passing the vapours of (D) into a solution of NaOH and d then adding the solutions of acetic acid and lead acetate a yellow precipitate of compound (E) is obtained. Identify A to E and give chemical equations involved.
 - Name the catalysts used in the
 - manufacture of ammonia by Haber's Process
 - oxidation of ethyne to ethanol
 - photographic industry.
 - Among TiCl_4 , VCl_3 and FeCl_2 which one will be drawn more strongly into a magnetic field and why?
 - How do you account for the following?
 - With the same d-orbital configuration (d^4), Cr^{2+} is a reducing agent while Mn^{3+} is an oxidising agent.
 - The actinoids exhibit a larger number of oxidation states than the corresponding members in the lanthanoid series.
 - Most of transition metal ions exhibit characteristic colours in aqueous solutions
 - What is meant by disproportionation? Give two examples of disproportionation reactions in aqueous solutions?
 - Describe the preparation of potassium from dichromate from chromite ore with chemical equations involved. What is the effect of increasing pH on a solution of potassium dichromate.
 - i) describe the commercial preparation of potassium permanganate from pyrolusite ore.
ii) Write ionic equation to represent the reaction of acidified KMnO_4 solution with oxalic acid

15. Give reasons for the following:

- i) Transition metals exhibit a wide range of oxidation states.
- ii) Cobalt(II) is very stable in aqueous solutions but gets easily oxidized in the presence of strong ligands.
- iii) Actinoids exhibit a greater range of oxidation state than lanthanoids

16. Compare the chemistry of actinoids with that of the lanthanoids with reference to the following

- i) Electronic configuration
- ii) Oxidation states
- iii) Chemical reactivity

5marks questions

1. A green compound 'A' on fusion with NaOH in presence of air forms yellow compound 'B' which on acidification with dilute acid, gives orange solution of compound 'C'. The orange solution when reacted with equimolar ammonium salt gives compound 'D' which when heated liberates nitrogen gas and compound 'A'. Identify compounds A to D and write the chemical equation of the reactions involved.

2. (i) How does the acidified potassium permanganate solution react with

- Iron(II) ions and
- Oxalic acid

Write the ionic equations for the reactions

(ii) Name the oxo metal anion of one of the transition metals in which metal exhibits the oxidation state equal to the group number

3. Assign reasons for the following :

- There is no regular trend in E° values of M^{2+}/M systems in 3d series.
- There is gradual decrease in the ionic radii of M^{2+} ion in 3d series.
- Majority of transition metals form complexes.
- Ce^{3+} can be easily oxidised to Ce^{4+}
- Tantalum and palladium metals are used to electroplate coinage metals.

4. Explain by giving suitable reason :

- Co(II) is stable in aqueous solution but in the presence of complexing agent it is readily oxidised.
- Eu^{2+} , Yb^{2+} are good reductants whereas Tb^{4+} is an oxidant.
- AgCl dissolves in ammonia solution
- Out of Cr^{2+} or Fe^{2+} , which one is a stronger reducing agent?
- The highest oxidation state is exhibited in oxoanions of a transition metal

5. When a white crystalline compound A is heated with $K_2Cr_2O_7$ and conc. H_2SO_4 , a reddish brown gas B is evolved, which gives a yellow coloured solution C when passed through NaOH. On adding CH_3COOH and $(CH_3COO)_2Pb$ to solution C, a yellow coloured ppt. D is obtained. Also on heating A

with NaOH and passing the evolved gas through K_2HgI_4 solution, a reddish brown precipitate E is formed.

6. a) Describe the preparation of potassium dichromate ($K_2Cr_2O_7$). Write the chemical equations of the reactions involved.
(b) "The chromates and dichromates are interconvertible by the change in pH of medium." Why? Give chemical equations in favour of your answer.
7. Explain giving reasons :
(a) Transition metals are less reactive than the alkali metals and alkaline earth metals.
(b) $E^\ominus_{Cu^{2+}/Cu}$ has positive value
(c) Elements in the middle of transition series have higher melting points.
(d) The decrease in atomic size of transition elements in a series is very small.
8. a) What is meant by disproportionation of an oxidation state. Give one example.
(b) Explain why europium (II) is more stable than Ce(II)?
9. a) Name element of 3d transition series which shows maximum number of oxidation states. Why does it show so?
b) Which transition metal of 3d series has positive $E^\ominus_{M^{2+}/M}$ value and why
c) Out of Cr^{3+} and Mn^{3+} , which is a stronger oxidising agent and why?
d) Name a member of the lanthanoid series which is well known to exhibit +2 oxidation state
e) Complete the following equation
 $MnO_4^- + 8H^+ + 5e^- \rightarrow$

Chapter 9

Coordination Compounds

1mark questions

1. Define the term coordination compound?
2. Why do tetrahedral complex not show geometrical isomerism?
3. Why does the colour changes on heating $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$
4. $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$ is strongly paramagnetic whereas $[\text{Fe}(\text{CN})_6]^{3-}$ is weakly paramagnetic. Explain.
5. What happens when potassium ferrocyanide solution is added to a ferric salt solution?
6. Write the oxidation state of nickel in $[\text{Ni}(\text{CO})_4]$
7. What is the coordination number of central atom in $[\text{Co}(\text{C}_2\text{O}_4)_3]^{3-}$?
8. Name the compound used to estimate the hardness of water volumetrically
9. What is a chelate ligand? Give one example.
10. Write the I.U.P.A.C. name of $\text{Li}[\text{AlH}_4]$.
11. name one homogeneous catalyst used in hydrogenation of alkenes
12. Name the types of isomerism shown by coordination entity : $[\text{CrCl}_2(\text{Ox})_2]^{3-}$
13. Write the formula and the name of the coordinate isomer of $[\text{Co}(\text{en})_3][\text{Cr}(\text{CN})_6]$
14. What are ambidentate ligands? Give an example?
15. Why is CO stonger than Cl^- ?
16. What is linkage isomerism? Give an example?
17. What is coordination and ionization isomerism?
18. Write the IUPAC of $[\text{CoCl}(\text{NO}_2)(\text{NH}_3)_4]\text{Cl}$.
19. What do you understand by denticity of a ligand?
20. What type of isomerism is exhibited by the complex: $[\text{Co}(\text{NH}_3)_6]^{3+} [\text{Cr}(\text{CN})_6]^{3-}$

2marks questions

1. A coordination compound has a formula $(\text{CoCl}_3 \cdot 4\text{NH}_3)$. It does not liberate NH_3 but precipitates chloride ion as AgCl . Give the IUPAC name of the complex and write its structural formula.
2. Give the electronic configuration of the d-orbitals of Ti in $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ ion in an octahedral crystal field.
3. What is spectrochemical series? Explain the difference between a weak field ligand and a strong field ligand
4. Write the correct formula for the following co-ordination compounds.
 $\text{CrCl}_3 \cdot 6\text{H}_2\text{O}$ (Violet, with 3 Chloride ions/ Unit formula)
 $\text{CrCl}_3 \cdot 6\text{H}_2\text{O}$ (Light green color with 2 Chloride ions/ unit formula)
5. $\text{Co}(\text{II})$ is stable in aqueous solution but in the presence of strong ligands and air, it can get oxidized to $\text{Co}(\text{III})$. (Atomic Number of cobalt is 27). Explain

6. Give a chemical test to distinguish between $[\text{Co}(\text{NH}_3)_5\text{Br}]\text{SO}_4$ and $[\text{Co}(\text{NH}_3)_5\text{Br}]\text{SO}_4\text{Br}$. Name the type of isomerism exhibited by these compounds.
7. What is the coordination entity formed when excess of aqueous KCN is added to an aqueous solution of copper sulphate? Why is that no precipitate of copper sulphate is obtained when H_2S (g) is passed through this solution?
8. What is meant by stability of a coordination compound in solution? State the factors which govern stability of complexes
9. Define (a) Homoleptic and (b) Heteroleptic complexes with the help of one example of each.
10. Explain Valence Bond Theory?
11. Using IUPAC norms write the formulae for the following :
 - (a) Tetrabromidocuprate (II)
 - (b) Pentaamminenitrito-O- Cobalt (III)
12. How does EDTA help as a cure for lead poisoning?
13. The $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$ ion contains five unpaired electrons while $[\text{Mn}(\text{CN})_6]^{4-}$ ion contains only one unpaired electron. Explain using Crystal Field Theory
14. Give reasons:
 - a) CO is stronger complexing reagent than NH_3 .
 - b) The molecular shape of $\text{Ni}(\text{CO})_4$ is not same as that of $[\text{Ni}(\text{CN})_4]^{2-}$
15. What is meant by crystal field splitting theory energy? How does the magnitude of splitting decide the actual configuration of d-orbitals in an octahedral field for a coordination activity?
16. What do you understand by stepwise stability constant and overall stability constant of a coordination compound? How are these two constants related?
17. Using the valence bond approach, deduce the shape and magnetic character of $[\text{Co}(\text{NH}_3)_6]^{3+}$ ion. Atomic no. of Co is 27.

3marks Questions

1. Aqueous copper sulphate solution (blue in colour) gives a green precipitate with aqueous potassium fluoride, a bright green solution with aqueous potassium chloride. Explain these experimental results
2. A metal complex having the composition $\text{Cr}(\text{NH}_3)_4\text{Cl}_2\text{Br}$ has been isolated in two forms, A and B. The form A reacts with AgNO_3 solution to give a white precipitate readily soluble in dilute aqueous ammonia whereas B give a pale yellow precipitate soluble in concentrated ammonia solution. Write the formulae of A and B and write their IUPAC names.
3. Explain the following
 - i. All octahedral complexes of Ni^{2+} must be outer orbital complexes.
 - ii. NH_4^+ ion does not form any complex
 - iii. $(\text{SCN})^{-1}$ ion is involved in linkage isomerism in co-ordination compounds.

4. A metal ion Mn^{+} having d^4 valence electronic configuration combines with three didentate ligands to form complexes. Assuming $\Delta_o > P$ Draw the diagram showing d orbital splitting during this complex formation. Write the electronic configuration of the valence electrons of the metal Mn^{+} ion in terms of t_{2g} and e_g . What type of the hybridization will Mn^{+} ion have? Name the type of isomerism exhibited by this complex.

5. Explain the following

i. $Cu(OH)_2$ is soluble in ammonium hydroxide but not in sodium hydroxide solution.

ii. EDTA is used to cure lead poisoning

iii. Blue coloured solution of $[CoCl_4^{2-}]$ changes to pink on reaction with $HgCl_2$

6. The coordination no. of Ni^{2+} is 4.

$NiCl_2 + KCN(\text{excess}) \rightarrow A$ (a cyano complex)

$A + ConcHCl(\text{excess}) \rightarrow B$ (a chloro complex)

i. Write IUPAC name of A and B

ii. Predict the magnetic nature of A and B

iii. Write hybridization of Ni in A and B

7. Draw the structure of

(a) cis-dichloridotetracyanochromate (II) ion

(b) mer-triamminetrichloridocobalt (III)

(c) fac-triaquatrininitrito-N-cobalt (III)

8. Name the central metal atom/ion present in (a) Chlorophyll (b) Haemoglobin

(c) Vitamin B-12.

9. Write the limitations of Valence Bond Theory

10. Draw a sketch to show the splitting of d -orbitals in an octahedral crystal field state for a d^4 ion. How the actual electronic configuration of the split d -orbitals in an octahedral crystal field is decided by the relative values of Δ_o and pairing energy (P)?

11. For the complex $[NiCl_4]^{2-}$, write

i) The IUPAC name

ii) The hybridization type.

iii) The shape of the complex

Atomic no of Ni is 28

12. For the complex $[Fe(en)_2Cl_2]Cl$, identify the following

i) Oxidation number of iron

ii) Hybrid orbitals and shape of the complex

iii) Magnetic behaviour of the complex

iv) Number of its geometrical isomers

v) Whether they may be optical isomer also.

vi) Name of the complex.

13. Explain the following

14. i) Low spin octahedral complexes of nickel are not known.
ii) The n complexes are known for the transition elements only.
iii) Co^{2+} is easily oxidized to Co^{3+} in the presence of a strong ligand.

15. Explain:

- i) Linkage isomerism
- ii) An outer orbital complex
- iii) A bidentate ligand

16. Explain with examples:

- i) Crystal field splitting
- ii) Linkage isomerism
- iii) Ambidentate ligand

17. Name the following coordination entities and describe their structure:

- i) $[\text{Fe}(\text{CN})_6]^{4-}$
- ii) $[\text{Cr}(\text{NH}_3)\text{Cl}_2]^+$
- iii) $[\text{Ni}(\text{CN})_4]^{2-}$



Chapter 10

Haloalkanes and Haloarenes

1mark questions

- Identify the most reactive among the given compounds.
a. $\text{H}_2\text{C} = \text{CH}-\text{Cl}$ b. $\text{CH}_3\text{CH}_2\text{Cl}$ c. $\text{H}_2\text{C} = \text{CHCH}_2\text{Cl}$ d. $\text{C}_6\text{H}_5\text{Cl}$
- Draw the structure of 2-bromopentane.
- What is the main product formed when 2-bromopentane is heated with potassium ethoxide and ethanol?
- In presence of peroxide HCl and HI do not give anti-Markovnikov's addition to alkenes. Why?
- Arrange the following in the order of increasing ease of dehydrohalogenation.
i. $\text{CH}_3\text{CH}_2\text{Cl}$ ii. $\text{CH}_3\text{CHClCH}_3$ iii. $\text{CH}_3\text{CCl}(\text{CH}_3)_2$
- Which is the better nucleophile- Bromide ion or Iodide ion. Why?
- A hydrocarbon C_5H_{12} gives only one monochlorination product. Identify it.
- Which isomer of $\text{C}_4\text{H}_9\text{Br}$ has the lowest boiling point?
- What happens when ethyl chloride is treated with aqueous KOH ?
- Draw the structure of 3-(4-chlorophenyl)-2-methylpropane
- Write a chemical reaction in which the iodide ion replaces the diazonium group in a diazonium salt.
- What happens when CH_3-Br is treated with KCN ?
- Draw the structure of 2-(2-bromophenyl)butane.

2marks Questions

- How to convert
i. 2-methylpropane to isobutyl bromide
ii. 2-iodopropane to 1-iodopropane
- Grignard reagent cannot be prepared from $\text{BrCH}_2\text{C}\equiv\text{CH}$. Explain why?
- Wurtz-Fittig reaction fails in case of tertiary butyl halide. Why?
- RCl is hydrolysed to ROH slowly, but the reaction is rapid if a catalytic amount of KI is added to the reaction mixture. Explain.
- How can you distinguish between the following pair
a. $\text{CH}_3-\text{CH}=\text{CHBr}$ & $\text{H}_2\text{C}=\text{CH}-\text{CH}_2\text{Br}$
b. 1,1-dichloroethane & 1,2-dichloroethane
- Write the difference between
(i) enantiomers and diastereomers
(ii) retention and inversion of configuration
- What are ambident nucleophiles? Explain with an example.

8. Account for the following:
- The C-Cl bond length in the chlorobenzene is shorter than that in $\text{CH}_3\text{-Cl}$.
 - Chloroform is stored in closed dark brown bottles.
9. Discuss the mechanism of $\text{S}_{\text{N}}1$ reaction of haloalkenes.
10. Write the IUPAC name of :
- $\text{CH}_2=\text{CHCH}_2\text{Br}$
 - 4-bromo-3-methylpent-2-ene.
11. Give one use of each of the following :
- Freon-12
 - DDT
 - Carbon tetrachloride
 - Iodoform
12. Give reasons for the following :
- The bond length of C-Cl bond is larger in haloalkanes than that in haloarenes.
 - Although alkyl halides are polar in nature but they are not soluble in water.
13. Chlorobenzene is extremely less reactive towards a nucleophilic substitution reaction. Give two reasons for the same.

3marks Questions

1. Give reasons:
- Ethyl iodide undergoes $\text{S}_{\text{N}}2$ reaction faster than ethyl bromide.
 - (±)2-butanol is optically inactive
 - C-X bond length in chlorobenzene is smaller than C-X bond length in $\text{CH}_3\text{-X}$.
2. Explain:
- The dipole moment of chlorobenzene is lower than that of cyclohexyl chloride.
 - Alkyl halides, though polar, are immiscible with water.
 - Grignard's reagents should be prepared under anhydrous conditions.
3. Although chlorine is an electron withdrawing group, yet it is ortho, para-directing in electrophilic aromatic substitution reaction. Explain, why is it so?
4. Answer the following:
- What is meant by chirality of a compound? Give an example.
 - Haloalkenes are easily dissolved in organic solvents.
 - What is known as racemic mixture? Give example.
5. State the reasons for the following
- Iodoform is obtained by the reaction of acetone with Hypiodite but not with iodide ion
 - Trichloromethane is stored in dark coloured bottles.
 - Haloarenes are insoluble in water but soluble in benzene.

6. Predict the order of reactivity of the following compounds in S_N1 and S_N2 reactions
- Four isomeric bromobutanes
 - Benzyl iodide, benzyl chloride, benzyl bromide.
 - CH_3Cl , CH_3Br , CH_3CH_2Cl , $(CH_3)_2CHCl$
7. Arrange the following in the increasing order of boiling point and state the reason for the order.
- $CH_3CH_2CH_2CH_2Br$, $(CH_3)_3CBr$, $(CH_3)_2CHCH_2Br$
 - 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene
 - $CH_3CH_2CH_2Br$, $CH_3CH_2CH_2Cl$, $CH_3CH_2CH_2I$
8. A Grignard reagent A and a haloalkane B react together to give C. Compound C on heating with KOH gives a mixture of two geometrical isomers D and E of which D predominates. C and E have same molecular formula and C gives 1-bromo-3-phenylpropane on reaction with HBr in presence of peroxide. Give the structures of A, B and C and configurations of D and E with reasons.
9. Give reasons for the following :
- chlorobenzene on reaction with fuming sulphuric acid gives ortho and parachlorosulphonic acids.
 - vinyl chloride is unreactive in nucleophilic substitution reaction
 - neopentyl bromide undergoes nucleophilic substitution reactions very slowly
10. a) Write a chemical test to distinguish between
- Chlorobenzene and benzyl chloride
 - Chloroform and carbon tetrachloride.
- b) Why is methyl chloride hydrolysed more easily than chlorobenzene.
11. Give reasons for the following observations
- p-dichlorobenzene has higher melting point than those of o and m-isomers.
 - Haloarenes are less reactive than haloalkanes towards nucleophilic substitution reaction.
 - The treatment of alkyl chloride with aqueous KOH leads to the formation of alcohol but in the presence of alcoholic KOH, alkene is the major product
12. Rearrange the compounds of each of the following sets in order of reactivity towards S_N2 displacement
- 2-bromo-2-methyl butane
1-bromopentane, 2-bromopentane
 - 1-bromo-3-methyl butane
2-bromo-2-methyl-butane
3-bromo-2-methyl butane
 - 1-bromobutane
1-bromo-2,
2-dimethyl propane,
1-bromo-2-methyl butane
1-bromo-3-methyl butane.

Chapter 11

Alcohols, Phenols, and Ethers

1mark questions

1. What is the main product obtained when vapors of t-butyl alcohol are passed over copper at 300°C?
2. Which of the following isomers is more volatile: o-nitrophenol or p-nitrophenol?
3. Phenol has smaller dipole moment than methanol. Why?
4. How is toluene obtained from phenol?
5. Write the structure of phenetole and give its IUPAC name.
6. Draw the structural formula of 2-methylpropan-2-ol molecule
7. Why are Grignard reagents soluble in ether but not in benzene?
8. Arrange the following compounds in the increasing order of acid strength.
Propan-1-ol, 2,4,6-trinitrophenol, 3-nitrophenol, 3,5-dinitrophenol
9. Di-tert butyl ether cannot be made by Williamson's synthesis. Why ?
10. Arrange the following alcohols in the order of increasing reactivity towards Lucas reagent
2-butanol, 1-butanol, 2-methyl-2-propanol
11. Alcohols act as weak bases. Why?
12. Name the phenol with molecular formula C_7H_8O which on treatment with Br_2 water readily gives a ppt. of $C_7H_5OBr_3$?
13. Phenol is acidic but does not react with $NaHCO_3$ solution?
14. How many ether metamers are represented by $C_4H_{10}O$?
15. Diethyl ether does not react with sodium .Why?
16. Which is stronger acid –Phenol or cresol? Why?
17. Name the products obtain when anisole is treated with HI?
18. Write the equation involved in the reaction Williamson's ether syntheses?
19. Write the structure of the following compound 2-methyl-2-ethoxypentane.
20. Phenyl methyl ether reacts with HI to give phenol and methyl iodide and not iodo benzene and methyl alcohol. Why?
21. Why is the preparation of ether by acid catalyzed dehydration of secondary alcohol not a suitable method?

2marks Questions

1. How are the following ethers prepared by williamson synthesis?
(a) Ethoxybenzene (b) 2-methoxy-2-methylpropane
2. Explain the following
(a) Cyclohexanol is more soluble in water than 1-Hexanol.
(b) Propane 1,3-diol is more soluble in the water than propan-1-ol.

3. Which alcohol with formula $C_4H_{10}O$ cannot be prepared by hydrogenation of aldehyde or ketone? Can you obtain this alcohol from corresponding alkyl halide? If possible write the equation.
4. Ethers are cleaved by acids not by bases. Why?
5. Write the equations involved in the following reactions
 - Acid catalysed dehydration of alcohols at 443K
 - Friedel-Crafts acylation of Anisole
6. Arrange the following in the increasing order of property shown :
 - phenol, o-nitrophenol, m-nitrophenol, p-nitrophenol. (Acid strength)
 - dimethylether, ethanol, phenol. (Solubility in water)
7. Give a chemical test to distinguish between the following pair of compounds.
 - n-propyl alcohol and isopropylalcohol
 - methanol and ethano
8. Give reason for the following :
 - The C–O–C bond angle in dimethyl ether is (111.7°)
 - Write suitable reaction for the preparation of t-butyl ethyl ether
9. Write the equations involved in the following reactions
 - Reimer-tiemann reaction
 - Kolbe's reaction
10. What happens when :
 - aluminum reacts with tert-butyl alcohol
 - cumene is oxidized in the presence of air and the product formed is treated with dilute acid
11. How will you convert:
 - toluene to benzyl alcohol
 - methyl bromide to 2-methoxy-2-methylpropane
12. Give mechanism of preparation of ethoxy ethane from ethanol?
13. Name the different reagents needed to perform the following reactions
 - Phenol to benzene
 - Dehydration of propan-2-ol to propene
 - Friedel-Crafts acylation of Anisole
 - Dehydrogenation of ethanol to ethanal.
14. Explain the mechanism of acid catalyzed hydration of an alkene to form corresponding alcohol.
15. How will you obtain
 - i) Picric acid from phenol?
 - ii) 2-methyl propanol from 2-methyl propene?

3 marks questions

1. How is tert-butyl alcohol obtained from acetone?
2. Which out of sodium and an. Calcium chloride be used for the dehydration of alcohols? Give reason.
3. Predict the products of the following reactions
 - i. Tetrahydrofuran + HBr (2 mol) →
 - ii. Tertiary butylbromide + sodiummethoxide→
 - iii. 2-methoxy-2-phenylpropane + HI (1mol) →
4. Why pcc cannot oxidise methanol to methanoic acid and while KMnO₄ can ?
(b)Why is reactions of alcohol/phenol and with acid chloride in the presence of pyridine ?
5. a)Why is preparation of ethers by acid catalysed dehydration of 2° and 3° alcohols not a suitable method ?
b)Why is Sulphuric acid not used during reaction of alcohol with KI?
c) How will you account for the following:
Ethers possess a net dipole moment even if they are symmetrical in structure?
6. a)R—Cl is hydrolysed to R—OH slowly but the reaction is rapid if a catalytic amount of KI is added to the reaction mixture.
b) What is formed if cyclopentanone is reduced with H₂ /Pt . Give equation for the reaction.
7. The treatment of alkyl chlorides with aq KOH leads to the formation of alcohols but in presence of alcoholic KOH, alkenes are the major products. Explain.
8. How would you convert:
 - i) phenol to benzoquinone
 - ii) Propane to 2-methylpropan-2-ol?
 - iii) propene to propan-2-ol?
9. Give reasons:
 - i) The boiling point of ethanol is higher than that of methanol
 - ii) o-and p-nitrophenols are more acidic than phenol
 - iii) propanol has higher boiling point than butane
10. i) the boiling pints of ethers are lower than isomeric alcohols
ii) Ortho-nitrophenol is more acidic than ortho-methoxy phenol.
iii) Preparation of ethers by acid dehydration of secondary or tertiary alcohols is not a suitable method.

Chapter 12

Aldehydes, Ketones, and Carboxylic Acids

1mark questions

1. Write the structure of p-methylbenzaldehyde.
2. Indicate the electrophilic and nucleophilic centres in acetaldehyde.
3. Give a test to distinguish between propan-2-one and pentan-3-one.
4. Write the structure of 4-chloropentan-2-one.
5. Explain Rosenmund reduction reaction?
6. How are formalin and trioxane related to methanal?
7. Illustrate Clemmensen reduction with the help of an example.
8. Name the aldehyde which does not give Fehling's soln. test.
9. Illustrate Wolff-kishner reduction.
10. Why HCOOH does not give HVZ (Hell VolhardZelinsky) reaction but CH₃COOH does?
11. Write the structure of 3-oxopentanal.
12. How will you convert bromobenzene to 1-phenyl ethanol?
13. Write the structure of 2-hydroxybenzoic acid.
14. Give chemical tests to distinguish between phenol and benzoic acid?
15. Explain decarboxylation with the help of reaction.
16. How will you convert benzoic acid to benzaldehyde?
17. Explain Hell-Volhard-Zelinsky reaction.
18. Arrange the following compounds in increasing order of their acid strength
(CH₃)₂CHCOOH, CH₃CH₂CH(Br)COOH, CH₃CH(Br)CH₂COOH
19. Would you expect benzaldehyde to be more reactive or less reactive in nucleophilic addition reaction than propanal? Explain.
20. Iodoform can be prepared from, all except.
 - (i) Ethyl methyl ketone
 - (ii) Isopropyl alcohol
 - (iii) 3-methylbutan-2-one
 - (iv) Isobutyl alcohol

2marks Questions

1. Which of the following is difficult to oxidize? Why?
HCHO, CH₃COCH₃, CH₃CHO
2. Arrange the following in the increasing order of the property indicated
 - (i) CH₃CHO, HCHO, CH₃COCH₃, C₆H₅CHO (reactivity towards HCN)
 - (ii) propan-1-ol, propanone, propanal (boiling point)

3. Give a plausible explanation for each one of the following:
- There are two $-NH_2$ groups in semicarbazide. However, only one such group is involved in the formation of semicarbazones.
 - Cyclohexanone forms cyanohydrins in good yield but 2,2,3-trimethyl cyclohexanone does not.
4. Give chemical tests to distinguish between the following pairs of compounds:
- Propanal to propanone
 - Benzaldehyde and benzoic acid
5. How will you convert:
- propene to propan-2-ol
 - Ethyl chloride to ethanal
6. Give one chemical test to distinguish between following pair of compounds: Write the chemical reaction involved
- ethanoic acid and ethylethanoate
 - acetophenone and benzophenone
7. Give one chemical test to distinguish between following pair of compounds:
- Ethanal and propanal
 - Benzoic acid and phenol
8. How will you convert:
- Acetylene to acetic acid
 - Toluene to m-nitrobenzoic acid
9. Give reasons:
- Chloroacetic acid is stronger than acetic acid
 - pH of reaction should be carefully controlled while preparing ammonia derivatives of carbonyl compounds.
10. Although phenoxide ion has more number of resonating structures than carboxylate ion, carboxylic acid is a stronger acid than phenol. Give reasons.
11. Give tests to distinguish:
- Ethanol and propanol
 - Benzoic acid and ethyl benzoate.
12. State reasons for
- Monochloroethanoic acid is weaker acid than dichloroethanoic acid
 - Benzoic acid is stronger acid than ethanoic acid
13. Give reason for the following:
- The α H atoms in ethanal are acidic in nature
 - cyclohexanone form cyanohydrin in good yield but 2, 2, 6 - trimethylcyclohexanone does not.
14. An aldehyde with molecular formula $C_5H_{10}O$ on treatment with 50% sodium

hydroxide gives sodium salt of an acid along with neopentyl alcohol. Suggest the structure of the aldehyde and write the chemical equation of the reaction involved.

3marks Questions

- How to convert:
 - Propanone to propane
 - Benzoyl chloride to benzaldehyde
 - Ethanol to but-2-enal
- An organic compound A contains 69.77% carbon, 11.62% hydrogen and rest oxygen. The molecular mass of the compound is 86. It does not reduce Tollen's reagent but forms an addition compound with sodium hydrogen sulphite and gives positive iodoform test. On vigorous oxidation, it gives ethanoic acid and propanoic acids. Derive the structure of compound A.
- Describe the mechanism of the addition of Grignard reagent to the carbonyl group of a compound to form an adduct which on hydrolysis yield an alcohol
 - Illustrate Cannizzaro reaction giving chemical equation
- An unknown aldehyde A on reacting with alkali gives a β -hydroxy aldehyde, which loses water to form an unsaturated aldehyde 2-butenal. Another aldehyde B undergoes disproportionation on reaction in the presence of concentrated alkali to form products C and D. C is an aryl alcohol with the formula C_7H_8O .
 - Identify A and B
 - Write the sequence of the reaction involved
 - Name the product when B reacts with Zn/Hg and HCl
- Two isomeric compounds A and B of the same formula $C_{11}H_{13}OCl$. Both are unsaturated and yield the same compound C on catalytic hydrogenation and produce 4-chloro-3-ethoxybenzoic acid on vigorous oxidation. B exist as geometrical isomers D and E but not A. Give the structure of A to E with proper reasoning
- An organic compound A($C_6H_{16}O_2$) was hydrolysed with dilute sulphuric acid to give carboxylic acid B and an alcohol C. Oxidation of C with chromic acid also produced B. On dehydration C gives-1-ene. Write the equations for the reactions involved.
- How to convert:
 - Ethyl cyanide to ethanoic acid
 - Butan-1-ol to butanoic acid
 - Benzoic acid to m-bromobenzoic acid
- How to convert:
 - Cyclohexanol to cyclohexan-1-one
 - Ethyl benzene to benzoic acid
 - Bromo benzene to benzoic acid.

5marks Questions

1. Write the IUPAC names of the following compounds:

- a) $\text{CH}_3\text{CO}(\text{CH}_2)_4\text{CH}_3$
- b) $\text{Ph}-\text{CH}=\text{CH}-\text{CHO}$

II) Describe the following conversions in not more than two steps:

- a) Ethanol to 3-hydroxybutanal
- b) Benzoic acid to m-nitrobenzyl alcohol
- c) Propanone to propene

2. Describe:

- a) aldol condensation
- b) Cannizzaro reaction
- ii) Describe a chemical test to distinguish between
 - a) Benzaldehyde and acetophenone
 - b) Propan-2-one and Propan-3-one
 - c) Ethanal and propanal.

3. A) An organic compound with molecular formula $\text{C}_9\text{H}_{10}\text{O}$ forms 2,4-DNP derivative, reduces Tollen's reagent and undergoes Cannizzaro's reaction. On vigorous oxidation, it gives 1,2-benzenedicarboxylic acid. Identify the compound.

b) Predict the structures of products formed when benzaldehyde is treated with

- Conc. NaOH
- $\text{HNO}_3/\text{H}_2\text{SO}_4$ (AT 273-283K)

4. An organic compound A of molecular formula, C_5H_8 when treated with sodium in liquid ammonia followed by reaction with normal propyl iodide yields B C_8H_{14} . A gives a ketone C $\text{C}_5\text{H}_{10}\text{O}$, when treated with dil. H_2SO_4 in presence of Hg^{2+} ions. B on oxidation with alkaline KMnO_4 gives two isomeric acids D and E $\text{C}_4\text{H}_8\text{O}_2$. Give structures of A to E with proper reasoning.

5. A) An organic compound a ($\text{C}_3\text{H}_8\text{O}$) on treatment with copper at 573K gives B. B does not reduce Fehling's solution but gives a yellow ppt of compound C with I_2/NaOH . Deduce the structures of A, B, and C.

B) explain:

- Aldehydes are more reactive than ketones towards nucleophiles
- The aldehydes and ketones undergo a number of addition reactions.

6. Explain

- i) $\text{Cl}-\text{CH}_2\text{COOH}$ is stronger acid than CH_3COOH
- ii) Carboxylic acids do not give reactions of carbonyl group
- iii) Aldol condensation

b) How would you obtain:

i) butanoic acid from butanol?

ii) Benzoic acid from ethyl benzene

7. An organic compound A on treatment with ethyl alcohol gives a carboxylic acid B and compound C. Hydrolysis of C under acidified condition gives B and D. Oxidation of D with KMnO_4 also gives B. B on heating with Ca(OH)_2 gives E having molecular formula $\text{C}_3\text{H}_6\text{O}$. E does not give Tollen's test and does not reduce Fehling's solution but forms 2,4-dinitrophenylhydrazone. Identify A,B,C,D,and E.
8. An organic compound A($\text{C}_7\text{H}_6\text{Cl}_2$) on treatment with NaOH solution gives another compound B($\text{C}_7\text{H}_6\text{O}$). B on oxidation gives an acid C($\text{C}_7\text{H}_6\text{O}_2$) which on treatment with a mixture of conc. HNO_3 and H_2SO_4 gives a compound D($\text{C}_7\text{H}_5\text{NO}_4$). B on treatment with conc. NaOH gives a compound E($\text{C}_7\text{H}_8\text{O}$) and $\text{C}_6\text{H}_5\text{COONa}$. Deduce the structures of A,B,C,D, and E.



Chapter 13

Amines

1 mark questions

1. Why Gabriel phthalimide synthesis is preferred for synthesising primary amines?
2. Why Diazonium salts of aromatic amines are more stable than those of aliphatic amines?
3. Why Aniline does not undergo Friedel-Crafts reaction?
4. Arrange the following compound in an increasing order of their solubility in water.
 $C_6H_5NH_2$, $(C_2H_5)_2NH$, $C_2H_5NH_2$
5. Direct nitration of aniline is not carried out. Why?
6. Out of normal butyl amine and isobutylamine which is more basic in aq solution?
7. Give a chemical test to distinguish between aniline and N-methylaniline.
8. Give a chemical test to distinguish between ethylamine and aniline.
9. Draw the structure of 2-aminotoulene.
10. Why electrophilic substitution takes place more readily in aromatic amines than benzene?
11. Write a chemical equation to illustrate the ammonolysis reaction.
12. Account methylamine in water reacts with ferric chloride to give a precipitate of ferric hydroxide.
13. Describe Hoffman bromamide reaction.
14. How will you convert benzene to aniline?
15. Give the IUPAC name of the compound $CH_3(CH_2)_2NH_2$ and classify into primary, secondary or tertiary amines.
16. Why can primary aromatic amines be not prepared by Gabriel phthalimide synthesis.

2 marks questions

1. Write short notes on acetylation.
2. Write chemical equations for the following reactions:
 - (i) Reaction of ethanolic NH_3 with C_2H_5Cl .
 - (ii) Ammonolysis of benzyl chloride and reaction of amine so formed with two moles of CH_3Cl
3. How will you convert 4-nitrotoluene to 2-bromobenzoic acid?
4. Describe the Hinsberg's test for identification of primary, secondary and tertiary amines. Also write the chemical equations of the reactions involved
5. Arrange the following in the increasing order of given property indicated
 - i) Aniline, p-toluidine, p-nitroaniline. (Basic strength)
 - ii) C_2H_5OH , $(CH_3)_2HN$, $C_2H_5NH_2$ (Boiling point)
6. Explain the following reactions:
 - i) Carbylamine reaction

- ii) Sandmeyer's reaction
7. How will you convert:
- Ethanamine to ethanoic acid
 - Aniline to iodobenzene
8. Which has higher boiling point and why?
- ethylamine and ethanol
 - ethylamine and ethanoic acid
9. Convert:-
- Aniline to benzylamine
 - Nitrobenzene to m-nitrophenol
9. Explain the following reactions:
- Gabriel phthalimide reaction
 - coupling reaction
10. Write chemical reaction to illustrate:
- Acetylation
 - Gatterman reaction
11. Give a chemical test to distinguish:
- Methylamine and dimethylamine
 - Aniline to N-methyl aniline
12. Explain:
- Anilines are less acidic than alcohols of comparable molecular masses
 - Aliphatic amines are stronger bases than aromatic amines
13. How will you bring about the following conversions:
- benzenediazonium chloride to nitrobenzene
 - hexanenitrile to 1-aminopentane

3marks questions

- How will you achieve the following conversions.
 - Aniline to nitrobenzene
 - nitrobenzene to p-bromoaniline
 - Ethylamine to ethylcyanide
- A compound 'X' having molecular formula C_4H_9NO reacts with Br_2 in presence of KOH to give another compound Y. The compound Y reacts with HNO_2 to form isopropylalcohol and N_2 gas. Identify the compound X and Y and write the reactions involved.
- Account for the following:
 - Primary amines ($R-NH_2$) have higher boiling point than tertiary amines
 - Pk_B of methylamine is less than that of aniline

- iii) $(\text{CH}_3)\text{NH}$ is more basic than $(\text{CH}_3)_3\text{N}$ in an aqueous solution
4. Explain why :
- amines are soluble in dilute HCl
 - methylamine in water reacts with ferric chloride to precipitate hydrated ferric oxide.
 - Although amino group is o, p-directing in aromatic electrophilic substitution reactions, aniline on nitration gives a substantial amount of m-nitroaniline
5. There is solution of p-hydroxybenzoic acid and p-aminobenzoic acid. Discuss one method by which we can separate them and also write down the confirmatory tests of the functional groups.
6. Why do amines act as nucleophiles? Give example of a reaction in which methylamine acts as a nucleophile.
7. An organic compound [A] $\text{C}_3\text{H}_6\text{O}_2$ on reaction with ammonia followed by heating yield B. Compound B on reaction with Br_2 and alc. NaOH gives compound C ($\text{C}_2\text{H}_7\text{N}$). Compound C forms a foul smelling compound D on reaction with chloroform and NaOH. Identify A, B, C, D and the write the equations of reactions involved
8. Accomplish the following conversions:
- Aniline to p-bromoaniline
 - Benzamide to toluene
 - Aniline to benzyl alcohol.
9. An aromatic compound 'A' on treatment with aqueous ammonia and heating forms compound 'B' which on heating with Br_2 and KOH forms a compound 'C' of molecular formula $\text{C}_6\text{H}_7\text{N}$. Write the structures and IUPAC names of compounds A, B and C
10. Complete the following reactions:
- $\text{C}_6\text{H}_5\text{N}_2\text{Cl} + \text{C}_6\text{H}_5\text{NH}_2 \rightarrow$
 - $\text{C}_6\text{H}_5\text{N}_2\text{Cl} + \text{CH}_3\text{CH}_2\text{OH} \rightarrow$
 - $\text{RNH}_2 + \text{CHCl}_3 + \text{KOH} \rightarrow$

Chapter 14

Biomolecules

1mark Questions

1. Which functional groups are present in monosaccharides?
2. Name polysaccharide which is stored in the liver of animals
3. Where does, the water present in the egg, go after boiling the egg?
4. Name an aldopentone, aldohexone and ketohexone.
5. Name the pines present in DNA.
6. Which of the two components of starch is water soluble
7. Glucose is an aldose sugar but it does not react with sodium hydrogen sulphite. Give reason
8. Give the structure of simplest optically active amino acid
9. What is glycosidic linkage?
10. What is meant by pyranose stricter of glucose?
11. What are the products of hydrolysis of lactose
12. What is meant by invert sugars?
13. What is the structural difference between glucose and fructose?
14. Name the enzyme which catalyses the hydrolysis of maltose into glucose
15. Name a water soluble vitamin which is a powerful antioxidant
16. Name a monosaccharide with D configuration which is laevo rotatory
17. Name only aminoacid in which the α amino group is secondary but not primary.
18. What is meant by the term DNA fingerprinting?
19. Except vitamin B₁₂, all other vitamins of group B, should be supplied regularly in diet. Why?
20. What are biocatalysts? Give an example.
21. Define peptide linkage?
22. Write the Zwitter ionic form of aminoacetic acid
23. What are polypeptides?
24. What causes pernicious amaemia?
25. Define zwitter ion with the help of an example.
26. What is biological effect of denaturation of proteins?

2marks Questions

1. What is the difference between the α -form of glucose and β -form of glucose? Explain.
2. Write such reactions and facts about glucose which cannot be explained by its open chain structure?
3. Fructose contains a keto group, but still it reduces Tollens reagent. Explain.
4. What are anomers. Give the structures of two anomers of glucose.

5. Write the products of oxidation of glucose with
 - (a) Bromine water
 - (b) Nitric acid
6. You have two amino acids, i.e. glycine and alanine. What are the structures of two possible dipeptides that they can form?
7. On electrolysis in acidic solution amino acids migrate towards cathode while in alkaline solution they migrate towards anode
8. Define the terms hypervitaminosis and avitaminosis
9. Answer the following questions:
 - i) Why are vitamin B and vitamin C essential for us?
 - ii) What is the difference between a nucleoside and nucleotide?
10. What is meant by denaturation of proteins?
11. Write the main structural difference between DNA and Rna. Of the four bases name those which are common to both DNA and RNA.
12. What do you understand by primary and secondary structure of proteins?
13. Mention the type of linkages responsible for the formation of the following:
 - i) Primary structure of the proteins
 - ii) Cross-linking of polypeptide chains.
 - iii) α -helix formation
 - iv) β -sheet structure
14. Under what conditions does each protein take a shape that is energetically most stable Explain
15. Why is cellulose in our diet not nourishing but is nourishing in grazing animals?
16. B complex is often prescribed vitamin. What is complex about it? What is its usefulness?
17. What are vitamins? Deficiency of which vitamin causes convulsions?
18. Give the sources of vitamin A and E and name the deficiency diseases resulting from lack of vitamin A and E in the diet
19. Difference between globular protein and fibrous protein.
20. Give reactions with support cyclic structure of glucose?

3marks Questions

1. How do you explain the absence of aldehyde group in the pentacetate of D glucose? Justify with equations
2. Sucrose does not reduce AgNO_3 but when pretreated with dil. Acid it does reduce. Why explain with equations?
3. i) Despite having an aldehyde group Glucose does not give 2,4-DNP test. What does this indicate?
ii) Glucose and fructose give the same osazone. Why? Explain.

4. What is meant glycogen? How is it different from starch? How is starch structurally different from cellulose?
5. How can reducing and non-reducing sugars be distinguished? Mention the structural feature characterizing reducing sugars?
6. Define:
 - i) Polysaccharides
 - ii) Amino acids
 - iii) Enzymes
7. After watching a programme on TV about the adverse effect of junk food and soft drinks on the health of school, Sonali, a student of class X11, discussed the issue with school principal. He immediately instructed the canteen contractor to replace the fast food with fiber and vitamins rich foods like sprouts, salads, fruits etc. This decision was welcomed by parents and the students
After reading the above passage, answer the following questions:
 - i) What values are expressed by Sonali and the principal of the school
 - ii) Give two examples of water soluble vitamins.
8. Amino acids may be acidic, alkaline, or neutral. How does this happen? What are the essential and non-essential amino acids? Name one of the each type.
9. Mention structural differences between amylopectin and cellulose.
10. Discuss the specificity and mechanism of enzyme action.
11. Define with example:
 - i) Isoelectric point
 - ii) Mutarotation
 - iii) Transcription

Chapter 15

Ploymers

1mark Questions

- Which of the following is fibre?
Nylon, Neoprene, PVC
- Which polymer is used for the controlled release of drugs in our body? What is its advantage?
- What is meant by PTFE? Give its popular name.
- Linking in benzene rings through - CH₂ - in bakelite is always at ortho and parapositions Why?
- Why is bakelite called a thermosetting polymer.
- Among fibres, elastomers and thermosetting polymers, which one has strongest intermolecular forces of attraction?
- How can you make a polyamide biodegradable?
- Can a copolymer be addition polymer? If so give one example
- Write the name of monomers of neoprene?
- In nylon-66, what does the designation '66' mean?
- What is the repeating structural unit in polythene polymer?
- Write the structure and one use of urea-formaldehyde resin?
- What is meant by copolymerization?
- Name the elastomer you will prefer to use for the manufacture of oil seals. Why?
- Name the polymer used for making radio television cabinets and feeding bottles of children.
- Write the full form of PHBV.
- Why benzoyl peroxide is used as an initiator for chain growth polymerization?
- Which of the following sets has all polymers capable of repeatedly softening on heating and hardening on cooling?
 - Glyptal, Melamine, PAN.
 - PVC, Polystyrene, polythene.
 - Polypropylene, urea formaldehyde resin, teflon.
- What is the function of sulphur in vulcanisation of rubber?
- Which polymer is obtained when free radical polymerization of chloropene occurs? Write the structures of polymers obtained.

2marks Questions

1. In what way PHBV and Nylon-2-nylon-6 are different from Nylon-66 and polyester. List out the differences.
2. Polymers of same monomer are used to manufacture carrybags as well as water storing tanks. Identify the polymers and explain the differences in their structures and properties.
3. Give the structure of monomer of neoprene. What is the advantage of neoprene over the natural rubber?
4. Give the mechanism of polymerization of ethene to polythene in presence of benzoyl peroxide
5. What is the difference between step growth polymer and chain growth polymer? Give Example.
6. Arrange the following polymers in the order of increasing intermolecular
7. forces :
(i)Nylon-6,6, Buna-S, Polythene.
(ii)Nylon-6, Neoprene, Polyvinylchloride
8. Can a copolymer be formed by both addition and condensation polymerization? Explain with the help of examples
9. Write the names of monomers used to give following polymers:
i) Buna-N
ii) Terylene
10. Write down the two differences between thermoplastic and thermosetting plastic and examples
11. What is biodegradable polymer? Give an example of a biodegradable aliphatic polyester.
12. Name the subgroups into which polymers are classified on the basis of magnitude of intermolecular forces.
13. Write the structure of repeating monomeric units of
i) Dacron
ii) Neoprene
iii) Polyvinyl chloride
iv) Teflon
14. What is the repeating unit in the condensation polymer obtained by combining $\text{HO}_2\text{CCH}_2\text{CH}_2\text{CO}_2\text{H}$ (succinic acid) and $\text{H}_2\text{NCH}_2\text{CH}_2\text{NH}_2$ (ethylene diamine)?
15. What is step growth polymerization? Explain the steps involved in the process.
16. Write the distinguishing feature between homopolymers and copolymers? Give examples.

3marks Questions

1. What is latex? Which polymer is derived from latex? How the properties of polymer can be improved?
2. Differentiate between the following pairs :

- (i) Branched chain polymers and cross linked polymers.
(ii) Thermoplastic and thermosetting polymers.
(iii) Chain growth and step growth polymerization
3. How does the presence of double bonds in rubber molecules influence their structure and reactivity?
4. Answer the following –
- Which material is used as substitute for wool in making commercial fibers as orlon or acrilan?
 - What are the conditions required for preparation of High density polythene.
 - Name and give the preparation of the polymer used for making unbreakable crockery
5. Explain:
- Biodegradable polymers
 - A biodegradable polymer is used in speciality packaging orthopaedic devices and in controlled release of drugs. Identify the polymer and give its structure.
6. Write Commercial importance of following polymers:
- Polypropene
 - Polystyrene
 - Glyptal
7. A regular copolymer of ethylene and vinyl chloride contains alternate monomers of each type. What is the weight percent of ethylene in this copolymer?
8. Write the names and structures of the monomers of the following polymers:
- Polysterene
 - Dacron
 - Teflon

Chapter 16

Chemistry in Everyday Life

1mark questions

1. Write the formula and IUPAC OF aspirin?
2. How does aspirin helps in removing pain?
3. What are limited spectrum antibiotics? Give one example?
4. What are antiseptics? Give example.
5. Baby soaps are soft soaps, write its chemical constituents
6. Write the use of chloro-xlenol
7. Name two types of the drugs classified on the basis of pharmacological effect
8. Why is sodium benzoate added to packed containers of jams and pickles?
9. Name a substance that can be used as an antiseptic as well as disinfectant
10. Give the composition of tincture of iodine.
11. A child when dropped his soap into a bathing tub, the soap did not sink but was floating. Suggest the method of manufacturing of the soap.
12. A patient tested to have gram positive bacterial infection. What type of antibiotic the physician might have prescribed to the patient? Justify
13. What problem arises in using alitame as artificial sweetener?
14. Why detergents are not biodegradable?
15. What is the cause of depression in human beings?
16. Why cationic detergents have limited use?

2mark questions

1. Explain with example:
 - i) Cationic detergents
 - ii) Anionic detergents
2. Differentiate between disinfectants and antiseptics with examples?
3. Explain the cleansing action of the soap? Why do soaps do not work on hard water?
4. Write the type and name of the detergent used in hair conditioner.
5. Why a drug should not be taken without consulting a doctor? Give two reasons
6. State the main difference between bacteriostatic and bacteriocidal antibiotics. Give one example of each.
7. Explain with example:

- i) Antifertility drugs
 - ii) Chemotherapy
8. Pick up the odd one among the following on the basis of medicinal properties mentioning the reason.
- i) Luminal, seconal, phenacetin, equanil.
 - ii) Chloroxylenol, phenol, chloroamphenicol, bithional.
9. What are antihistamines. Give two examples
10. i) Why aspartame cannot be used in cooked foods?
ii) Which type of people take artificial sweetening agents and why?
11. a) Soframycine is an antiseptic and not disinfectant. Give reason.
b) If water contains dissolved calcium bicarbonate, out of soaps or detergents, which one will you choose for cleaning clothes?
12. a) Boric acid is a weak antiseptic than tincture of iodine. Give reason.
b) Tincture of iodine is preferred over iodoform as antiseptic. Why?
13. What are barbiturates? What is the action of barbiturates on human body?
14. Discuss two ways in which drugs prevent the attachment of natural substrate on active sites of an enzyme.
15. What are neurologically active drugs? Give two examples.
16. Mention one important use of the following-
- (i) Equanil
 - (ii) Sucrose

3marks Questions

1. Describe the following with suitable example-
 - (i) Disinfectant
 - (ii) Analgesics
 - (iii) Broad spectrum antibiotics
2. While antacids and antiallergic drugs interfere with the function of histamines, why do these not interfere with the function of each other? Explain.
3. Low level of noradrenaline is the cause of depression. What types of drugs are needed to cure this problem? Name two drugs.
4. Account for the following:
 - i) Aspirin drug prevents heart attacks
 - ii) Diabetic patients are advised to take artificial sweeteners instead of natural sweeteners.
 - iii) Detergents are nonbiodegradable while soaps are biodegradable.
5. Pick out the odd one amongst the following on the basis of their medicinal properties. Give suitable reason.
 - (i) Luminal, seconal, terfenadine, equanil.
 - (ii) Chloroxylenol, phenol, chloroamphenicol, bithional.
 - (iii) Sucralose, aspartame, alitame, sodium benzoate

6. Give the main function of following in the body of human beings.
 - (i) Enzymes
 - (ii) Receptor proteins
 - (iii) Neurotransmitter
7. How synthetic progesterone derivatives act as antifertility drugs. Explain and mention two commonly available drugs in the market.
8. Give the pharmacological function of the following type of drugs:
 - (i) Analgesics
 - (ii) Tranquilizers
 - (iii) Antifertility drugs
9. Give the class of drugs to which these substances belong :
 - (i) Bithional
 - (ii) Amoxycillin
 - (iii) Salvarsan
10. Explain the following terms with suitable examples :
 - (i) Cationic detergents
 - (ii) Anionic detergents
 - (iii) Nonionic detergents

